Dorsal Preservation Versus Structural Techniques and Their Application

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KEYWORDS

• Structure rhinoplasty • Preservation rhinoplasty • Dorsal preservation • Cartilage grafting • Dorsal hump • Structural grafting • Subdorsal Z-flap • Tetris

KEY POINTS

- Structure and preservation rhinoplasty can be used in a hybrid approach applying dorsal preservation in the upper two-thirds of the nose and structure techniques in the lower third of the nose.
- Dorsal preservation allows preservation of the integrity of the middle vault eliminating the need for spreader grafts. This leaves more cartilage for the structural grafting of the nasal tip.
- Dorsal preservation can be used in most primary rhinoplasties and also for augmentation rhinoplasty in ethnic patients.

PANEL DISCUSSION QUESTIONS

Discuss How They Differ
What is more effective?
How to decide on proper technique.
What is the optimal patient for preservation rhinoplasty?
What is the optimal patient for structural approaches?
How have your techniques in this area changed over the past 2 years?

INTRODUCTION

Structure rhinoplasty and preservation rhinoplasty are two important rhinoplasty philosophies that have been around for many years. Structure rhinoplasty was introduced in 1989 by Johnson and Toriumi and involved using structural grafts such as columellar struts and spreader grafts in rhinoplasty.[1] These grafts were applied using the external rhinoplasty approach. At that time, the use of cartilage grafts and the open approach were felt to be unnecessary. Over the years, many surgeons have adopted structure techniques into their surgical armamentarium. Additionally, the open approach has become a favored approach for performing rhinoplasty. Before structure rhinoplasty came to the forefront, endonasal rhinoplasty techniques were the primary approach for rhinoplasty. With the introduction of structure rhinoplasty, there was a movement away from endonasal rhinoplasty.

Thirty-five years later, we are in a time when there is a resurgence of endonasal rhinoplasty. However, the endonasal approach used these days is much different from that used pre-structure (before the

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early 1990s). Previously endonasal rhinoplasty was primarily a reductive operation with significant cephalic trim or division of the domes of the lateral crura and classic Joseph humpectomy using a rasp or Rubin osteotome.

The resurgence of endonasal rhinoplasty has coincided with the increased popularity of dorsal preservation. Dorsal preservation has been around since the early 1900s.[2–5] Yves Saban was a critical figure in the resurgence of dorsal preservation.[5] With the increased interest in dorsal preservation, there has been an improvement in nasal tip concepts that align with the concepts of dorsal preservation. Many of these concepts have been refined by Baris Cakir with his polygon tip concept.[6–8] Rollin Daniel has termed this new improved form of endonasal rhinoplasty as "preservation rhinoplasty."[9] Preservation rhinoplasty focuses on the preservation of the native anatomy of the nose including the cartilage, bones, ligaments, and soft tissues. The term "preservation" refers to the approach used to access the structures, preservation of the nasal dorsum, and preservation of the tip structures (lateral crura). Whether or not this is a true preservation technique is not the point. The primary point is to preserve ligaments and structures that can positively impact the outcomes and potentially simplify the operation. For example, dorsal preservation involves preserving the leading edge of the nasal dorsum (dorsal aesthetic lines) and therefore eliminating the need for camouflaging the edges of the cut nasal bones and the need for reconstruction of the middle vault using spreader grafts or spreader flaps.

The polygon tip surgery described by Cakir focuses on innovative delivery of the tip cartilages using an endonasal approach, preservation of the Pitanguy and scroll ligaments, and managing the nasal tip with a columellar strut, tip suturing, and tensioning of the lateral crura.[6–8] These tip concepts incorporate elegant preservation of important support structures coupled with minimally invasive maneuvers to alter tip contour.

With the resurgence of endonasal rhinoplasty, we have circled back to the "closed rhinoplasty," however, with a newfound respect for the nasal structures to increase the control of postoperative healing and improved command of important features such as the supratip break and facet contour.

HOW DO STRUCTURE AND PRESERVATION DIFFER?

Kridel

Both methods are used to reduce the dorsal bony and cartilaginous nasal bridge, commonly when there is an unwanted hump present.

Traditional structural methods are much simpler and have many fewer potential and easily remedied complications: a rasp, chisel, or drill (piezo or regular drill burr) directly remove the top layer of the bony dorsum and a knife is used to take down the cartilaginous contribution to the hump. A precise contour and smooth dorsum can easily be achieved. Personally, I prefer to use tungsten carbide rasps to take down the bone as any asymmetric irregularities (such as in a fractured or deviated nose) can be precisely contoured. With rasps or a drill, one does not have to worry about taking down too much bone as can occur with a chisel, which invariably can over shorten the lateral nasal bones, making an open roof more possible. If a large bony hump is removed, medial and lateral osteotomies are performed to maintain a narrow dorsum and prevent an open roof. The osteotomies must be complete with no green-sticking or else the nasal bones will later re-lateralize.

If a large component of cartilaginous dorsum is shaved down, the upper lateral cartilages will be separated from the septum and spreader grafts; either turn-in spreaders or spreader grafts are used to prevent a too narrow mid vault.

The area is irrigated out to prevent any bone particles from remaining. One can then palpate over the skin overlying the dorsum with a gloved wet finger to check for smoothness. If any irregularities are found, further rasping or excising can be done. If any small depressions are found, they can easily be filled in with finely crushed cartilage taken from the septum. If the individual has very thin dorsal skin as is seen in some revision patients, temporalis fascia or acellular dermis may be placed over the corrected dorsum.

One great advantage to this traditional technique is that one knows exactly what the dorsum will look like over time. No later changes occur to the dorsal profile except in rare instances. If a bony callus forms, it can be watched expectantly and if it is not resolved, an 18-gauge needle may be inserted through the skin in the office and the area scraped down. If this is not helpful or if true bony fullness exists, a simple rasping can be done in the office under local. In my practice, such an incidence is under 1%.

On the other hand, dorsal preservation rhinoplasty (DPR) techniques remove the support under the cartilaginous and bony dorsum, and the original dorsum is either "pushed-down" or "let-down" to a lower height. This "new" preservation technique is not new, but was first done about 100 years ago and then abandoned in the United States while it was still popular in Mexico, South America, and in parts of Europe. It has come back into fashion with the introduction of better

tools such as piezo and is now being re-born in several arenas. Such maneuvers leave the cap of the dorsum intact and preserve its original contours except for the hump, which is pulled down and, in some cases, fixed by sutures.

However, to accomplish this, much has to be done to the underlying structures, which are not necessary in traditional structural reduction. The nasal septum must be entered, and various strips of septal cartilage are removed and/or sutured. There are no less than 4 major different septal cartilage excisions and suture techniques espoused by the various proponents of DPR with no current comparative studies analyzing which may be the best.

In the let-down technique, extensive lateral bone removal is accomplished bilaterally often with piezo instrumentation with the potential for uneven removal or excessive removal creating lateral step offs. In the push-down technique, the lateral nasal bones are dis-attached with piezo laterally, medialized, and pushed down into the nose, where they can create segments of bone that can be visible within the internal nose and can lead to nasal obstruction.

But what seems to be the most disruptive of normal dorsal support and contour is the transverse osteotomy across the nasion, which allows the superior portion of the dorsum to come in. The resulting step off created may not be visible in the immediate post operative period but when one looks at the x-ray of the area, one might be worried about the long-term result. Certainly, patients will be able to palpate this irregularity even if it is not initially visible and may be bothered by this. Carlos Neves MD, a proponent of the DPR, has published an article showing this step-off (**Fig. 1**)[10]

Neves also lists a table of "Drawbaks and Stigmata" with the DPR (**Box 1**).

It is notable that hump recurrence is number 1 on the list with DPR, which is in marked divergence with traditional hump removal. Another potential complication can occur when some surgeons add the Ballerina maneuver technique to this, which is a separation of the upper lateral cartilages from the undersurface of the nasal bones as espoused by Goksel to allow for a flatter push-down of the dorsum; an inverted V deformity can occur because of this dis-articulation.

Most/Patel

Fundamentally, while dorsal preservation and structural techniques, which the authors will hereafter describe as conventional hump resection (CHR) aim to lower a dorsal hump in an aesthetically pleasing fashion, the former aims at maintaining the complex relationship between the bony and cartilaginous dorsum/septum while the latter disrupts these relationships. Understanding the

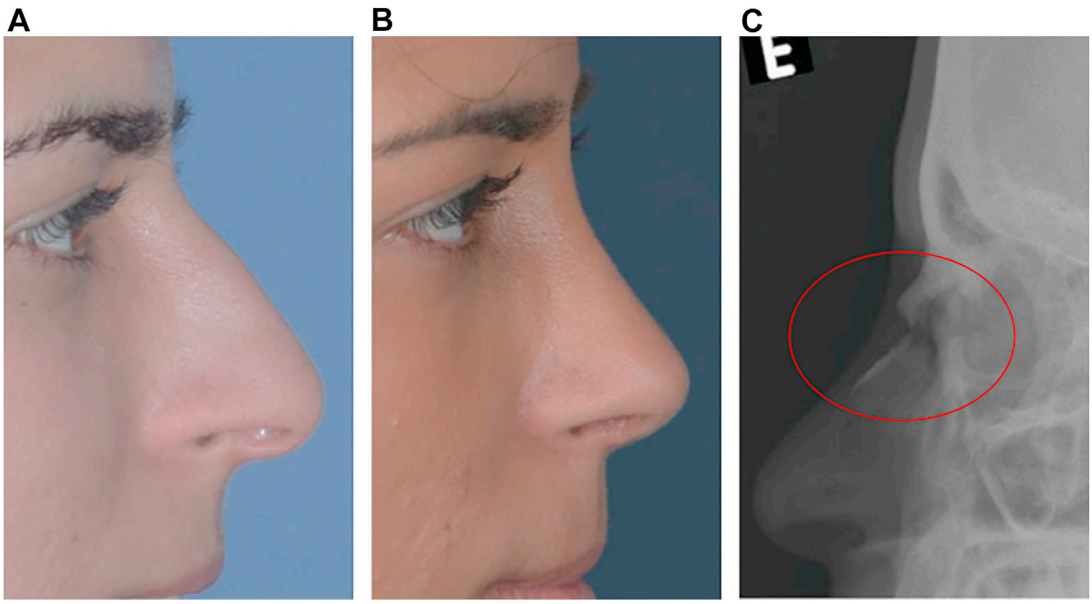

Fig. 1. (*A*, *B*) Let-down technique with loss of perpendicular ethmoidal plate control creating a low radix of the nose, that was partially compensated with grafts (*C*) The Rx image shows the loss of control of the patient's pyramid. *Circle* shows the drop in the radix position and bone step off. (*From* Neves JC, Arancibia-Tagle D. Avoiding Aesthetic Drawbacks and Stigmata in Dorsal Line Preservation Rhinoplasty. Facial Plast Surg. 2021 Feb;37(1):65-75. https://doi.org/10.1055/s-0041-1725101. Epub 2021 Mar 1. PMID: 33648013.)

Box 1
Drawbacks and stigmata

Profile view drawbacks and stigmata

Hump recurrence

Radix step

Low nasal radix and dorsum

Supratip saddling

Frontal view drawbacks

Pyramid lateralization

Pyramid broadening

Functional impairment

Blockage associated with push-down (bone impaction)

Blockage associated with LKA disarticulation

Abbreviation: LKA, lateral Keystone area.
From Neves JC, Arancibia-Tagle D. Avoiding Aesthetic Drawbacks and Stigmata in Dorsal Line Preservation Rhinoplasty. Facial Plast Surg. 2021 Feb;37(1):65-75. https://doi.org/10.1055/s-0041-1725101. Epub 2021 Mar 1. PMID: 33648013.

difference between these techniques requires an appreciation of the anatomic makeup of the dorsum.

The medial keystone of the nose consists of the intersection of the upper lateral cartilages with the bony and cartilaginous septum (**Fig. 2**). At this site, the septal cartilage extends under the nasal bones, and it has been found that the majority of the dorsal hump sits above the cartilaginous septum rather than the bony septum.[11] This has implications for both CHR and preservation techniques, albeit differently. When resecting a dorsal hump in CHR techniques, resection of bone will reveal a cartilaginous septum that commonly requires excision at its superficial component. In preservation techniques, excision of septal cartilage lower in the nose (many times without bone) will allow for the lowering of both the bony and cartilaginous dorsum. In addition, at the dorsal bony-cartilaginous junction, there is a non-rigid fusion of the perichondrium of the cartilaginous vault with the periosteum of the nasal bones.[12] In preservation cases, this allows for at least partial flexion at this site in combination with the profile lowering necessary to reduce dorsal convexities. In CHR cases, direct excision of the convexity is instead performed to flatten the dorsum.

In preservation cases, the medial keystone is preserved. As such, the attachments of the upper lateral cartilage are maintained. Conversely, with CHR cases, there is separation of these attachments and potential additional manipulation of the upper lateral cartilage. As such, rebuilding of the midvault with spreader grafts or autospreader flaps are imperative, as are osteotomies to close an open roof. Since the external contour of the nose is not violated in preservation cases, these maneuvers are not required and there is a lower risk of superficial contour irregularities.

Importantly, preservation cases should not be differentiated from structural cases by a lack of resection. Both preservation and structural cases require excision and manipulation of the osseocartilaginous framework. In structural cases, direct excision of bone and cartilage at the dorsum achieves aesthetic goals. In preservation cases, the bony vault is separated from the attachments at the maxilla and frontal bone (with or without excision of bone at the lateral nasal sidewall) with additional septal resection to lower the dorsum. The osteotomies performed laterally in these cases mirror those performed in CHR cases. Ultimately, while preservation cases treat the osseocartilaginous vault as a single unit, CHR cases segmentalize these components.

It should also be noted that newer preservation techniques incorporate surface modifications

Fig. 2. The medial extension of the upper lateral cartilages under the nasal bones (NBs) and the bony-cartilaginous junction of the septum all contribute the medial/dorsal keystone (*dotted blue line*). This anatomic region contributes to the dorsal hump and is violated in conventional structural hump resection cases, whereas it is maintained in preservation cases.

with or without the need for osteotomies and some techniques separate the treatment of the bony dorsum from the cartilaginous midvault.[13] As such, there is a growing fusion between CHR and preservation ideologies for treatment of the dorsum. In addition, the combination of preservation techniques to the dorsum and open structural modifications to the nasal tip ("Structural Preservation") are similarly uniting these ideologies.

Papel

Structural rhinoplasty has been the dominant mode of nasal surgery for the past 30 to 35 years. The key intent is to preserve the key points of stability to not only provide good contour but resist the powerful factors of scar contraction and gravity for years after surgery. The most common techniques used include osseocartilaginous hump reduction, lateral and/or medial osteotomies, maintaining a septal L-strut, and tip techniques as indicated including grafts and sutures.

Preservation rhinoplasty, in its recent form, seeks to maintain the dorsal rhinion anatomic unit where the bone and cartilage come together. To accomplish this goal, techniques such as circumferential osteotomies, lateral bone excision, partial dissection of the lateral keystone area, and reduction of septal height with fixation are necessary. As in structural rhinoplasty, tip techniques can vary widely.

Toriumi

Structure rhinoplasty is primarily based on the open rhinoplasty approach and the use of structural grafting to stabilize the nasal structures after moderate degrees of reduction and division of the ligamentous support of the tip. Structure rhinoplasty incorporates compensatory maneuvers to account for what has been lost in the process of exposure and reduction of the nasal structures. The "tip split" approach to the nasal septum involves dissection between the medial crura to then perform septal work. This tip-split approach divides some of the critical support structures of the nasal tip. To compensate for this loss of tip support, most surgeons place a columellar strut or caudal septal extension graft.[1,14–16] The dorsal hump is lowered by removing the leading edge of the nasal dorsum, which necessitates reconstruction with spreader grafts or spreader flaps.

Preservation rhinoplasty, or specifically dorsal preservation, involves preservation of the leading edge of the nasal dorsum as the upper lateral cartilages meet the dorsal septum with some potential modification of the bony cap. The middle vault is not opened as the dorsal hump is lowered by manipulating the nasal septum from below to align the profile. This can be accomplished by high, intermediate, or low septal manipulation.

The primary difference between structure and preservation lies in that the former resects and modifies necessitating structural grafting to stabilize the structure to withstand the forces of healing and reestablish proper contour. Preservation rhinoplasty preserves the favorable aspects of the nasal anatomy and limits the removal of tissues to minimize the need for restructuring the nose.

WHAT IS MORE EFFECTIVE?

Kridel

Both are just techniques to achieve the same results of a decreased dorsal profile while preserving dorsal aesthetic lines from the frontal view. Surgeons should use the techniques, which in their hands are the most reproducible with the best cosmetic result while preserving the nasal airway with the fewest possible potential complications. Most all surgeons agree, however, that the learning curve for the DPR method is indeed steep and more complex when compared to traditional hump reduction. For me, keeping it simple with bony reduction with a rasp and trimming the cartilaginous dorsum has stood the test of time in my practice for over 40 years and I see little need for DPR.

I have taken a strip of septal cartilage out over the maxillary crest when there is septal deviation and I have needed to go into the septum; this maneuver, when combined with freeing up the attachment of the cartilaginous septum from the bony perpendicular plate, allows a swinging door of the septum, and the caudal septum can then be sewn in the midline to the periosteum of the nasal spine. At those times, when I also wish to de-project the tip and a little bit of the dorsal cartilaginous septum, I have taken some extra septal cartilage in a strip leaving a small gap between the inferior portion of the septum and the maxillary crest, so that when I suture the caudal end of the septum to the spine, the Vicryl suture I use does de-project a certain amount depending on amount of gap created. However, when no septal work is needed when there is no septal deviation, not having to go into the septum at all reduces potential complications such as septal perforations and saves time.

Most/Patel

While preservation rhinoplasty can impart a negative connotation to excisional techniques, which have been labeled as "destructive," both structural and preservation techniques are effective in achieving universal goals in rhinoplasty: namely a functionally and aesthetically sound result that

Fig. 3. Preoperative and 1 year postoperative images are shown here in a patient undergoing a structural preservation with a let-down and modified subdorsal strip method. Note that the preoperative dorsal aesthetic lines are preserved.

will stand the test of time (**Figs. 3–5**). For many years, the largely pervasive structural approach has resulted in high rates of patient satisfaction. Reported outcomes with preservation techniques are growing, but still more limited relative to the long-term data available for structural techniques.

Since preservation techniques maintain the external nasal contour on frontal view, in patients with ideal dorsal aesthetic lines preoperatively, preservation may be more effective in maintaining this appearance (see **Figs. 3** and **4**). Since CHR approaches require disruption of and recreation of the

Fig. 4. Preoperative and 1 year postoperative images are shown here in a patient with a deviated nose undergoing a structural preservation with an asymmetric let-down, modified subdorsal strip method, and right septal extension graft.

Fig. 5. Preoperative and 9-month postoperative images are shown here in a patient undergoing a structural revision rhinoplasty including anterior septal reconstruction, spreader grafting, and diced cartilage for camouflage. Note that in the interim, the patient was treated with a forehead flap (nasal tip only) by an outside Mohs surgeon.

dorsal aesthetic lines, there is a higher risk of having irregularities at the dorsum. Alternatively, CHR approaches will be more efficacious in correcting inherently deformed bones with irregularities or significant width of either the bones or midvault (as preservation techniques will not alter these deformities; see **Fig. 5**).[10,17] One concern with preservation techniques is the incomplete elimination of or recurrence of dorsal humps, with rates ranging between 3% and 12%.[18–23] This may be higher than CHR approaches in which a direct excision of the hump is performed.

Comparative studies between preservation and CHR techniques have shown varying results, but largely they have similar patient satisfaction outcomes. In a randomized prospective study comparing the modified preservation technique (spare roof technique) to component dorsal hump reduction (n = 250), functional and cosmetic visual analog scale (VAS) scores were superior in the former group.[24] However, in a cadaveric radiologic study, the internal nasal valve (INV) dimensions/angle did not change between the traditional letdown (LD) technique or Joseph hump resection with appropriate midvault reconstruction.[25] In a matched cohort study, Standardized Cosmesis and Health Nasal Outcomes Survey (SCHNOS) and VAS scores were no different between patients undergoing open approach LD preservation compared to open structural rhinoplasty.[26] A similar outcome was noted in a comparison of Dorsal Preservation and Dorsal Reduction Rhinoplasty analyzing nasal patency and outcomes with Rhinomanometry, Nasal Obstruction Symptom Evaluation (NOSE) Scale, and SCHNOS outcomes.[27] These later studies suggest that while preservation rhinoplasty is a fundamentally sound methodology, well-executed CHR surgery with adequate midvault reconstruction yields similarly excellent results. It is important to note that some of our outcome measures may not be granular enough to elucidate some of the more subtle benefits (eg, quality of dorsal aesthetic lines) seen with preservation techniques.

Papel

The answer to this question will depend on the bias and experience of the surgeon. Comparison of both techniques' long-term results with scientific data is not available. Experienced surgeons will have long-term data on one technique or another, but this type of data are just beginning to build for the "preservation" techniques. It is important to point out that rhinoplasty with push-down and let-down techniques has been around for a very long time. I have found references in the literature about preservation type surgery as far back as 1932. Maurice Cottle taught these techniques extensively in the 1940s and 1950s in numerous courses and publications.

Fig. 6. This patient underwent prior rhinoplasties and required extensive structural grafting for reconstruction. (*A*) Preoperative base view showing nasal vestibular stenosis. The yellow arrow points to the right vestibular stenosis. (*B*) View of asymmetric and over-reduced tip cartilages. (*C*) Placement of lateral crural strut grafts. (*D*)

When I was a resident, we had several rhinoplastic surgeons in our community who were associated with the Cottle courses and routinely used push-down and let-down techniques in their surgery. My observation of these cases was that there was often persistent wideness of the dorsum, and hump recurrence was higher than expected. In addition, the lateral nasal bone excisions were difficult to judge and perform.

In summary, direct comparison is very difficult currently. With further experience by a wider number of surgeons, this should change.

Toriumi

Both structure rhinoplasty and preservation rhinoplasty are effective. Structure rhinoplasty is the most versatile of the philosophies as it can be used in almost all rhinoplasty cases. If a patient is not a candidate for preservation rhinoplasty, they would likely be a candidate for structure rhinoplasty. As to which is more effective, it depends on the application of the technique and the patient's specific anatomic findings and intended outcome.

In cases of revision rhinoplasty, structure rhinoplasty is far more effective as many of these cases require more of a reconstructive mode, and in many cases, there is little that can be preserved. In most revision cases, the nasal dorsum has been manipulated and the nasal tip likely has been altered. In these cases, structural cartilage grafting will be necessary to reconstruct the nasal dorsum and nasal tip. Costal cartilage or auricular cartilage may be needed for the cartilage graft stock. In many cases, I will use spreader grafts, caudal septal extension graft, and lateral crural strut grafts (**Fig. 6**). In these cases, there is little that is preserved and most of the major structures require some degree of reconstruction.

In some select revision cases, there may be a residual dorsal hump and the middle vault may be intact. In these rare cases, dorsal preservation can be used to reduce the dorsal hump and straighten the nose. I will use a subdorsal Z-flap, Tetris, or low strip to accomplish these tasks (**Fig. 7**). If the roof of the bony vault has been resected or the roof of the middle vault has been removed, dorsal preservation is not effective.

In revision rhinoplasty, a structural approach is very effective, and preservation is only rarely an option.

In primary rhinoplasty, preservation rhinoplasty is highly effective. I have shifted to using dorsal preservation in over 90% of my primary rhinoplasty cases. In most cases, I use a hybrid of structure and dorsal preservation (structural preservation rhinoplasty).[28] I will use dorsal preservation to manage the upper two-thirds of the nose to modulate the dorsal hump and structure in the nasal tip (caudal septal extension graft and lateral crural strut grafts). I find this hybrid approach to be very effective both aesthetically and functionally.

I also find the "push-up" using the subdorsal cantilever graft to be very effective in augmenting the nasal dorsum in the saddle nose deformity and in ethnic patients with a low dorsum.[29]

Both structure and preservation are effective approaches to rhinoplasty and in many cases, a combination of both provides the best outcomes.

HOW TO DECIDE ON THE PROPER TECHNIQUE?

Kridel

As stated earlier, there is no "proper" technique. It depends on the experience of the surgeon. There are many ways up the mountain. One should learn multiple techniques so that when one way is blocked due to the encountered physical anatomy, the armamentarium of the surgeon provides other approaches. For the novice surgeon, it is probably best to use the technique with the least chance for serious or multiple complications.

Most/Patel

Selecting the best technique in rhinoplasty is dependent on a number of pre-operative historic and examination findings. Despite the positive outcomes and patient satisfaction observed in both CHR and preservation techniques, we find that preservation minimizes the risks of dorsal irregularities requiring camouflaging and is superior at maintaining the dorsal aesthetic lines. Postoperatively, the dorsal contour appears smoother more immediately. Given these findings, preservation is a preferred technique where possible. Therefore, it is easiest to first determine if a patient is a candidate for preservation. If not, it is next determined if the patient's nasal morphology can be converted into a preservation case via surface techniques (eg, rasping/osteoplasty). If criteria are not met, then patients are treated with a CHR

Lateral crural strut grafts in place. (*E*) Tip after lateral crural strut grafts positioned. (*F*) Hinged auricular composite graft placed to open the right nasal valve. (*G*) Immediate postoperative base view. (*H*) Preoperative frontal view (*left*). Two-year postoperative frontal view (*right*) (*I*) Preoperative lateral view (*left*). Postoperative lateral view (*right*). (*J*) Preoperative oblique view (*left*). Postoperative oblique view (*right*). (*K*) Preoperative base (*left*). Postoperative base view showing open nasal vestibule (*right*).

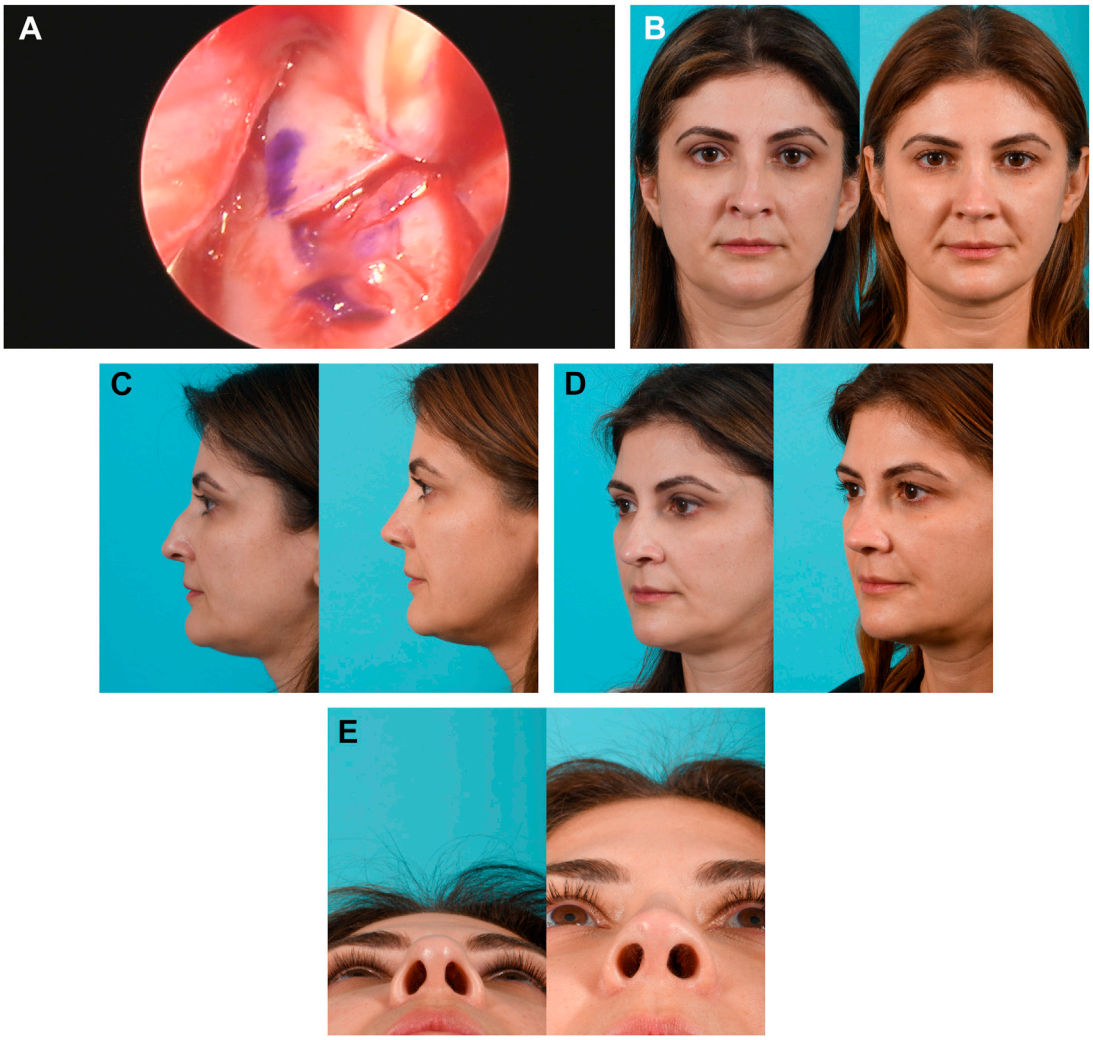

Fig. 7. Patient with a dorsal hump and deviation after prior rhinoplasty. (*A*) Subdorsal Z-flap incised for overlap to correct the deviation. (*B*) Preoperative frontal view (*left*). Two-year postoperative frontal view (*right*). (*C*) Preoperative lateral view (*left*). Postoperative lateral view showing straight dorsum (*right*). (*D*) Preoperative oblique view (*left*). Postoperative oblique view (*right*). (*E*) Preoperative base view (*left*). Postoperative base view (*right*).

approach. It is possible to convert from a preservation to CHR technique intraoperatively if needed.

Preservation cases ideally involve an aesthetically pleasing dorsum on frontal view (**Fig. 3**). If there is a break in the dorsal aesthetic lines and this is secondary to a small irregularity in the bone, many times this can be contoured. If there are straight axis deviations, this can also be corrected with preservation techniques incorporating asymmetric resection of bone (with more resected from the non-deviated size; see **Fig. 4**).[30–32] Significant deformities or S-shaped deviations will be difficult to correct with preservation strategies.

Significant violation and/or resection of the septum or dorsum from prior trauma or surgery may preclude preservation since integrity and structure in these areas are paramount to successful stabilization of the osseo-cartilaginous framework. Very significant septal deformities, for similar reasons, are better treated with CHR methods (see **Fig. 5**). Caudal septal deviations are not contraindications to preservation strategies. Preservation septal techniques such as the modified subdorsal strip method allow for complete anterior septal reconstruction and the cottle method allows for repositioning of the septum.[33–37]

Those patients with a significantly kyphotic hump (or S shaped nasal bones rather than V shaped) may not be appropriate candidates for preservation secondary to a risk of incomplete hump elimination/hump recurrence or a significant

drop in the height of the radix while attempting to lower the dorsum.[10,13,17] Similarly, patients with deeper nasofrontal angles are at greater risk of a drop in the radix with DPR technqiues.[18] It should be noted that the use of bony contouring and radix grafts can be used to manage these issues and therefore these are not absolute contraindications to preservation rhinoplasty.

Papel

Most surgeons will decide to use techniques they are confident will provide good results. It is understandable that many are hesitant to change from structural rhinoplasty to preservation techniques when they have not seen a mass migration of surgeons move in that direction. American Academy of Facial Plastic and Reconstructive Surgery (AAFPRS) meetings, and other specialty societies, give much attention to preservation techniques, but I have not seen this playing out in the general community.

There has been much discussion about whether preservation of the dorsal osseocartilaginous subunit is really a "preservation" technique. To move the dorsum lower, or higher, aggressive mobilization of the entire bony structure, septal resection with designed flaps, and possible lateral separation of the keystone area (Ballerina Technique) are required. When this is accomplished, the entire dorsum is mobile, and the final position depends on accurate placement of septal sutures. Some see this as an aggressive (not preservative) technique with many moving parts. This possibly contributes to the hesitation of surgeons to switch from structural methods.

Toriumi

Many factors come into play when deciding on the proper technique in structure or preservation rhinoplasty. In structure rhinoplasty, the technique used depends on the type of grafting employed and the intended changes desired. You can choose between a columellar strut and a caudal septal extension graft to support the nasal base. My preference is a caudal septal extension graft if a tip-split approach to the septum is used.[14,15] I will use spreader grafts in most cases to reconstruct the middle vault if a component hump reduction was used to reduce the dorsal hump. I rarely do this anymore, so the spreader grafts are primarily used in revision rhinoplasty.

In preservation rhinoplasty, the technique used can vary depending on what the goals are and what type of deformity is noted in the patient. If the patient has a small dorsal hump that is primarily bony, it may be sufficient to use a surface technique with rhinosculpting of the bony cap and limited subdorsal work to lower the middle vault prominence. This could include a high strip, subdorsal Z-flap, or Tetris.[38,39] With larger dorsal humps, it will likely require foundational work such as a push-down of a letdown in combination with the subdorsal septal work (high strip, subdorsal Z-flap, or Tetris).

In patients with an axis deviation with a dorsal hump, a subdorsal Z-flap or Tetris can be used and overlapped on the side opposite the deviation and sutured in the overlapping orientation. If the patient has a deviated nose with moderate to severe septal deviation, a low strip (Cottle, SPQR) can be used to straighten the septum and reduce the dorsal hump.[4,40] The low strip can also be used in the deviated nose without a dorsal hump by performing a swinging door septoplasty where the quadrangular septal cartilage flap is reduced to fit properly in the space occupied by the septum and then fixed back to the nasal spine. In this case, the septal flap is not rotated to reduce a hump but just resized and shifted to the midline to fit into the subdorsal space.

An Ishida cartilaginous push down with or without bony cap preservation or spare roof type B can be useful in patients with a larger bony hump with some S-shaped characteristics. In this case, triangles of bone are removed along the sides of the dorsal hump and then the bony cap is collapsed on itself and sutured into a reduced position.[41] If the radix is low, it can be augmented with a small radix graft.

WHAT IS THE OPTIMAL PATIENT FOR PRESERVATION RHINOPLASTY?

Kridel

A patient who does not need tip work, in whom an endonasal rhinoplasty might alternatively be considered, and who has only a dorsal hump might be a candidate for DPR, especially if you do not like taking a dorsum down traditionally. But DPR is more disruptive and is a lot of extra work for something done much more easily via a rasp and a blade. If you do need to do tip work, you might as well do a traditional hump removal since you are already there. Additionally, with traditional rhinoplasty that requires middle vault trimming, spreader grafts are often needed which require cartilage for grafting. If a turn-in method is not used for spreaders, a patient who requires septal cartilage for other grafts might not have enough to do spreaders also and so might be considered for DPR.

Most/Patel

The optimal patient for preservation rhinoplasty has not had prior nasal surgery or significant

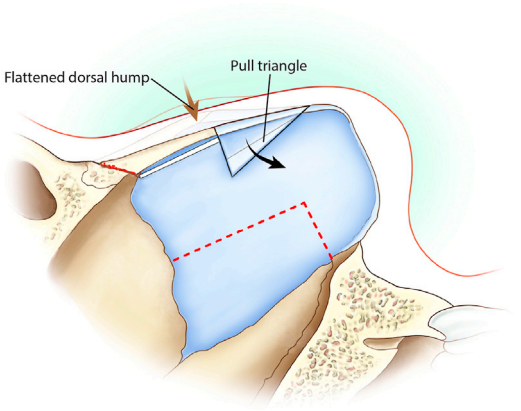

Fig. 8. Subdorsal Z-flap showing overlapping of the septal flap on the right side to correct axis deviation.

nasal trauma. Dorsal aesthetic lines are pleasing on frontal view. The profile view demonstrates a broad hump rather than significant kyphosis. Anatomically, this correlates with V-shaped and S-shaped bones, respectively. The latter group has a higher likelihood of an osseous residual hump without additional contouring maneuvers.[10,13,17] Ideally, the septum is either non-deviated or has minor deviations lower and posteriorly. The dorsal hump in the ideal preservation patient has a greater cartilaginous contribution with a corresponding shorter nasal bone length.[18] Since the middle vault cannot be separated from its pyrifom attachments, it will flare as it descends. As such, the ideal preservation nose will not have wide or prominent upper lateral cartilage shoulders. The radix in the optimal patient should not be deep. Preservation has been reported to reduce revision rates in males compared with other surgical techniques, potentially due to less risk of feminization.[13] Higher revision rates may be observed in females due to the desire for greater dorsal height reduction.[13] However, both males and females with realistic expectations are great candidates for preservation techniques.

Papel

The ideal patient for let-down or push-down techniques would exhibit small to moderate humps, normal or high radix, have an intact septum, and a normal dorsal width.

Toriumi: The optimal patient for dorsal preservation will have a narrow dorsum with V-shaped dorsal hump with a normal radix and shorter nasal

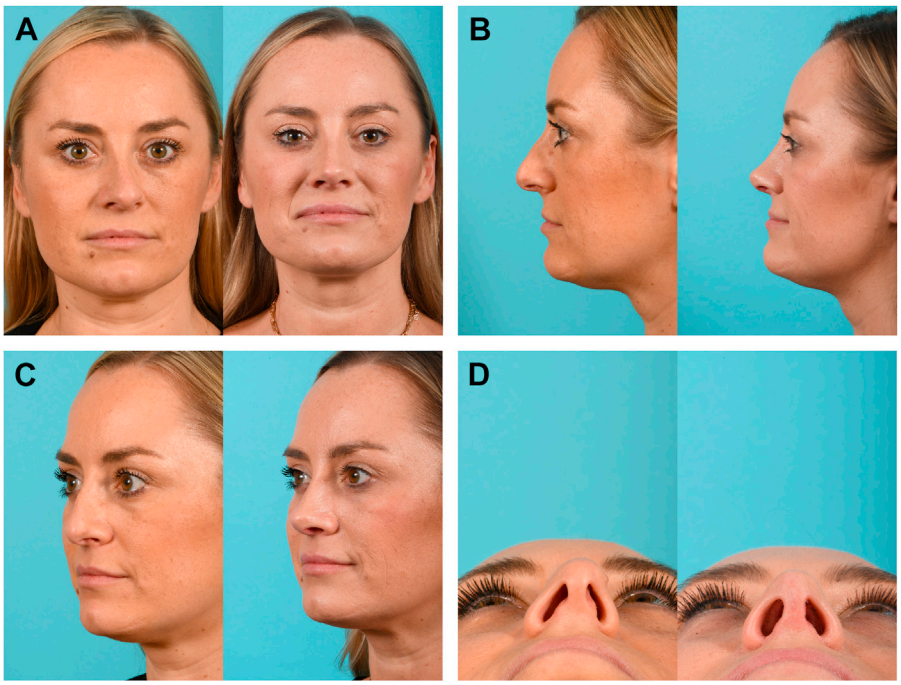

Fig. 9. Patient with a deviated nose and dorsal hump. (*A*) Preoperative frontal view showing the deviated nose (*left*). Two-year postoperative frontal view showing the straight nose (*right*). (*B*) Preoperative lateral view (*left*). Postoperative lateral view and the straight dorsum (*right*). (*C*) Preoperative oblique view (*left*). Postoperative oblique view (*right*). (*D*) Preoperative base view (*left*). Postoperative base view (*right*).

Fig. 10. Several before and after frontal views demonstrating patients treated with structural rhinoplasty techniques. In the first case, osteotomies as well as dorsal augmentation/camouflage with diced rib were performed. In the second and third cases, the dorsal aesthetic lines were narrowed using piezo osteotomy and osteotomy of the dorsum.

bones. It is more favorable to have shorter nasal bones as this equates to an easier dorsal reduction with the designated subdorsal manipulation. Depending on the technique chosen for the dorsal preservation, it may be more favorable to have a slight axis deviation that needs to be corrected. With the slight axis deviation, the subdorsal Z-flap can be overlapped on the side opposite the

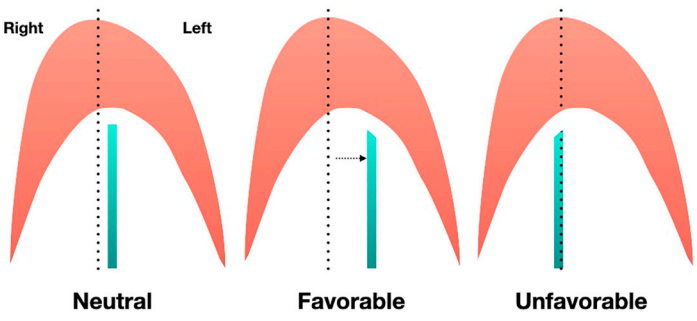

Fig. 11. The relationship between the position of the high septum and the external nasal deviation may help identify patients that are better suited for preservation cases. As shown here, with an external deviation of the nasal pyramid to the right, a high septal deviation to the contralateral side will permit mobilization of the nasal framework to the left. The dorsal septal gap (DSG) is larger and therefore favorable for structural hump resections. If the septum has a high deviation to the ipsilateral side, there is a smaller DSG, which will limit the medialization of bone if doing a conventional hump resection. In this latter scenario, a preservation procedure may be more optimal.

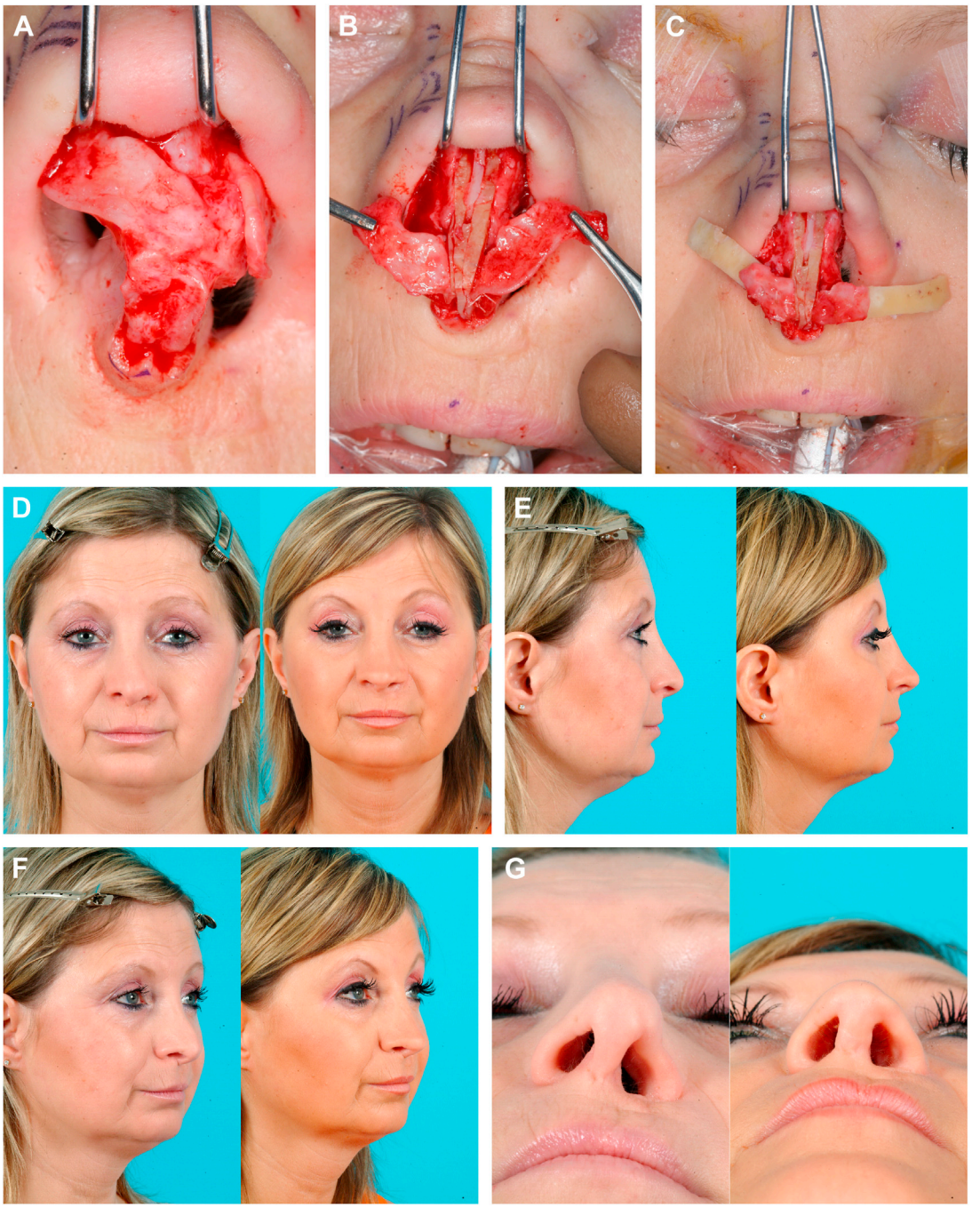

Fig. 12. A patient with unilateral cleft nasal deformity with asymmetric tip and deficient nasal base. (*A*) Intraoperative view of the asymmetric tip cartilages. (*B*) Lateral crural replacement grafts positioned. (*C*) Lateral crural strut grafts in place. (*D*) Preoperative frontal view (*left*). Two-year postoperative frontal view showing improved symmetry (*right*). (*E*) Preoperative lateral view (*left*). Postoperative lateral view (*right*). (*F*) Preoperative oblique view (*left*). Postoperative oblique view (*right*). (*G*) Preoperative base view showing asymmetries (*left*). Postoperative base view showing improved symmetry (*right*).

deviation providing a more stable fixation of the Z-flap to the remnant septal strut (**Fig. 8**; **Fig. 9**). On the other hand, with the high strip, it is better to have a straight nose with no axis deviation.

The optimal patient for a preservation rhinoplasty using an endonasal approach such as the polygon tip, will have a symmetric tip with more normally positioned lateral crura. It is

also favorable to have longer stronger medial and lateral crura. Patients requiring shortening of their nose are also more favorable.

WHAT IS THE OPTIMAL PATIENT FOR STRUCTURAL APPROACHES?

Kridel

Structural approaches have stood the test of time for over 40 years, producing precise, long lasting, aesthetically pleasing, and functional noses with very minimal complications in the hands of a skilled surgeon in all patients. Those with such successful outcomes need not adopt a different approach DPR solely because those who are marketing this reborn old approach to the public as "the latest and greatest" are purporting it to be superior or the way to go. We need to be sure that those who advocate for DPR are inclusive in discussing the downsides of the procedure and that they present long-term results of at least 5 years in their presentations and that they benchmark their results with the traditional methods.

Most/Patel

Patients who are optimal candidates for preservation rhinoplasty will inherently also be great candidates for CHR rhinoplasty. This includes primary patients with realistic expectations and with good integrity of the septum and nasal framework. However, relative to preservation, CHR rhinoplasty will more optimally treat very deformed noses or wider noses on frontal view (**Fig. 10**). CHR techniques will also be more consistent in effectively treating very large dorsal humps. In a meta-analysis of 22 studies representing a cohort of 5660 patients undergoing a variety of DPR techniques, postoperative hump recurrence rates were 4.18%.[42] The rates in CHR rhinoplasty are likely lower, especially when considering large kyphotic humps, although this has not been definitively confirmed in long-term comparative studies. Regarding the dorsum, while patients with any skin quality are great candidates for preservation, the optimal patients for CHR rhinoplasty have medium to thicker skin. This is for the purposes of minimizing the visibility of any irregularity in the dorsum.

While the deviated nose and septum can be optimally managed with CHR methods, a caveat is worth noting. In the setting of high septal deviations, structural techniques work well if the side of the septal deviation is away from the side of the nasal deviation (**Fig. 11**). In this favorable scenario, after a hump takedown, there is a gap (the dorsal septal gap, DSG) for bone to medialize toward the deviated septum.[36] Alternatively, if the septum deviates to the same side as the deviated nasal vault, this will limit the medialization of bone and the ability to correct the deviation. (if doing a standard hump takedown). In this scenario, a preservation procedure may be more optimal.

Papel

This patient can have a hump of any size. The radix can also be variable. If the dorsum is wide, it can be managed easier with a structural plan. As always, an intact septum allows for more flexibility and potential grafts.

Toriumi

The optimal patients for structural approaches are patients who require reduction and reconstruction of the middle vault and tip. These patients are those with severe tip asymmetries and those with inherent middle vault cartilage deformity or extremes in projection. Patients who have undergone prior rhinoplasty and who require dorsal, or tip reconstruction are ideal candidates for the structure approach as long as cartilage is available for grafting. In most revision cases, costal cartilage will be needed if the septum has been operated in the previous operation.

Patients with cleft nasal deformity, nasomaxillary dysplasia/deficiency (Binders syndrome), and other nasal deformities are great candidates for structure rhinoplasty (**Fig. 12**).[5,43]

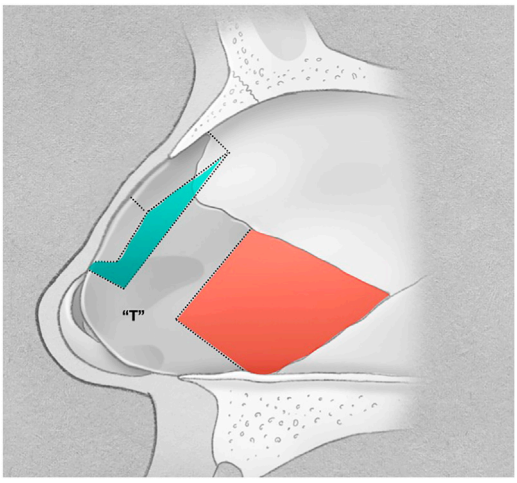

Fig. 13. In the Modified Subdorsal Strip Method, cartilage is resected from the intermediate portions of the septum (*blue*) with preservation of a subdorsal strut. Lower portions of septum can be resected (*red*) if there are deviations or for grafting needs. This leaves a "T" strut of cartilage that involves the caudal septum and an intact mid septal segment.

Fig. 14. A patient who underwent prior rhinoplasty with alar retraction, polybeak deformity, and inverted-V deformity with low dorsum. (*A*) Tall spreader grafts extending above the upper lateral cartilages for augmentation. (*B*) Preoperative frontal view showing inverted-V deformity (*left*). One year and 3-month postoperative frontal view showing improved dorsal aesthetic lines (*right*). (*C*) Preoperative lateral view (*left*). Postoperative lateral view showing augmented dorsum (*right*). (*D*) Preoperative oblique view (*left*). Postoperative oblique view (*right*). (*E*) Preoperative base view (*left*). Postoperative base view showing improved symmetry (*right*).

HOW HAVE YOUR TECHNIQUES IN THIS AREA CHANGED OVER THE PAST 2 YEARS?

Most/Patel

Until approximately 5 years ago, the most common technique used in our practice was a CHR method. This mirrors the rhinoplasty climate globally.[44] However, with time, and particularly over the past 5 years, preservation rhinoplasty has made up a larger majority of primary rhinoplasty cases. Importantly, as our practice includes a high number of revision or traumatic cases, structural techniques remain prevalent. It is important to recognize that these 2 techniques are not mutually exclusive and rather we feel together they contribute to the versatility of our rhinoplasty armamentarium.

As noted earlier, there are a number of techniques and modifications that have emerged within preservation rhinoplasty. Our preferred method is the modified subdorsal strip method, which affords the ability to address septal deviations (including

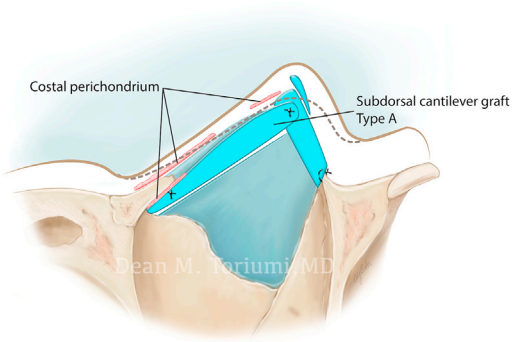

Fig. 15. Subdorsal cantilever graft type A showing extension under NBs to elevate the middle vault. Note the fixation to the caudal septal extension graft caudally.

caudal) and harvest cartilage for grafting purposes (**Fig. 13**).[36] This technique has allowed for the treatment of functional complaints in addition to aesthetic concerns, allowing for its expanded use in our practice. Additionally, we find that we are increasingly converting patients to preservation candidates through surface modifications (eg, osteoplasty) where possible. Again, as part of our algorithm, the goal is to perform preservation where feasible. The fusion of conventional open structural techniques for the nasal tip and preservation methods for the dorsum ("structural preservation") has additionally allowed for us to increasingly incorporate preservation into practice.[45] This may be especially important for rhinoplasty surgeons who are starting to utilize preservation. As with any method in rhinoplasty, preservation techniques certainly have a learning curve and we continue to learn about the nuances and remain critical of our results as time progresses.

Papel

I have been observing push-down and let-down techniques for many years. While rare in the United States until recently, these operations have been common in parts of Europe, the Middle East, and South America. I have had the good fortune to have visited these areas frequently and directly observed surgical procedures on a regular basis. Therefore, I have had a long exposure to these procedures.

> I have often observed how the midportion of the nose is so mobile and the final position dependent on a single polydioxanone (PDS) suture pulling the dorsum down to the septal strut. This is not always an easy task but is critical to the success of dorsal preservation rhinoplasty.

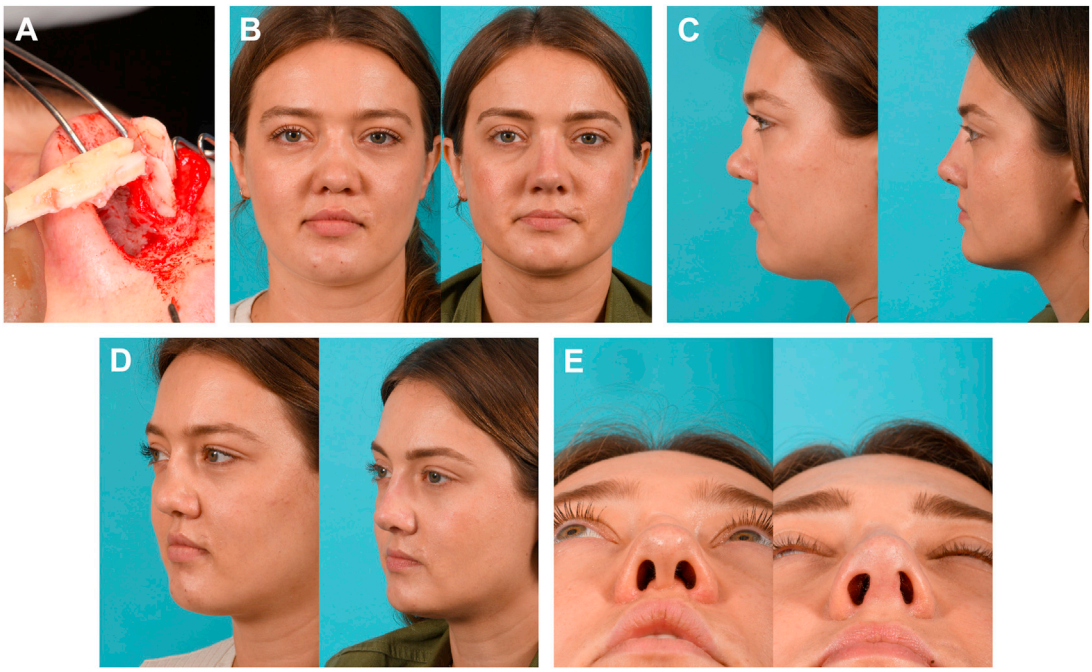

Fig. 16. Patient with a saddle nose deformity. (*A*) Subdorsal cantilever graft type A. (*B*) Preoperative frontal view (*left*). Fifteen-month postoperative frontal view showing improved dorsal aesthetic lines (*right*). (*C*) Preoperative lateral view showing saddle nose deformity (*left*). Postoperative lateral view showing improved profile (*right*). (*D*) Preoperative oblique view (*left*). Postoperative oblique view (*right*). (*E*) Preoperative base view (*left*). Postoperative base view (*right*).

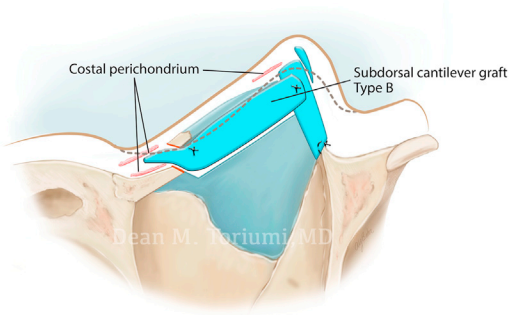

Fig. 17. Subdorsal cantilever graft type B showing cranial extension through the radix osteotomy site to raise the radix and fixation caudally to the caudal septal extension graft.

I have performed thousands of rhinoplasty procedures using a large variety of techniques. It is apparent that the modern preservation techniques are more subtle and better planned than what I saw more than 35 years ago. At this point, I feel I can control the rhinoplasty better with structural methods and depend on long-term stable results. With this said, I will continue to study and observe all new techniques, including modifications to the "dorsal preservation" methods, which have been described for more than 90 years.

Toriumi

My techniques in both structure and preservation have changed over the past two to 4 years. For structure, over the past 4 years, I have made 4 major changes in technique as noted.

1. One of the major changes is that I no longer use onlay dorsal grafts when I need to augment the nasal dorsum. I either use "tall spreader grafts" or the subdorsal cantilever graft. Tall spreader grafts are spreader grafts that extend higher than the existing dorsum to increase dorsal height.[16] The tall spreader grafts will reconstruct the middle vault and increase dorsal height. I use them in revision rhinoplasty cases. I do not need spreader grafts in primary cases as I do not open the middle vault. The tall spreader grafts can also create narrowing of the dorsum and provide symmetric dorsal aesthetic lines (**Fig. 14**). With tall spreader grafts, I can raise the dorsum up to 4 mm in height.

   For major dorsal augmentation, I will use the subdorsal cantilever graft to raise the dorsum in primary ethnic augmentation cases.[29] With the subdorsal cantilever graft, I perform a complete release of the nasal bones and lateral keystone, then

Fig. 18. Patient with a low radix and low dorsum with a wide nasal base. (*A*) View of subdorsal cantilever graft type B with attached perichondrium (*yellow arrow*). (*B*) Preoperative frontal view showing flat dorsum and wide base (*left*). Two-year postoperative frontal view showing improved dorsal aesthetic lines and narrower base (*right*). (*C*) Preoperative lateral view showing low radix (*left*). Postoperative lateral view showing higher radix and projected nasal tip (*right*). (*D*) Preoperative oblique view (*left*). Postoperative oblique view (*right*). (*E*) Preoperative base view showing wide base (*left*). Postoperative base view showing narrow nasal base (*right*).

Fig. 19. Banana-shaped bone strip removal for letdown foundational reduction of the dorsal hump.

raise the dorsum (push-up) and hold it in an augmented position using a graft placed under the dorsum. The subdorsal cantilever graft type A raises the dorsum with minimal radix augmentation and is ideal for saddle nose repair (**Figs. 15** and **16**). The subdorsal cantilever graft type B raises the radix as well as the dorsum of the nose (**Figs. 17** and **18**). I find the subdorsal cantilever graft to be very effective for ethnic augmentation cases requiring dorsal augmentation.

Fig. 20. This patient presented with acute nasal trauma and the deviated nose with a dorsal hump. (*A*) Intraoperative view of the incised Tetris flap. (*B*) Overlapped and sutured Tetris flap to the side opposite the deviation. (*C*) Preoperative frontal view showing the deviated nose (*left*). One year and 3 months postoperative frontal view showing straight nose (*right*). (*D*) Preoperative lateral view showing dorsal hump (*left*). Postoperative lateral view showing straight dorsum (*right*). (*E*) Preoperative oblique view (*left*). Postoperative oblique view (*right*). (*F*) Preoperative base view (*left*). Postoperative base view (*right*).

2. Another major change I have made in structure rhinoplasty is the use of platelet-rich fibrin and fat for dorsal nasal camouflage in patients with thin skin. I use this primarily in revision rhinoplasty cases with thin skin or damaged skin. This technique of platelet rich fibrin (PRF) fat was introduced by Milos Kovacevic.[43] Fat is harvested and chopped into fine pieces and then combined with platelet-rich fibrin to create a sheet of fat that can then be placed over the nasal dorsum for camouflage. I have found this to be very helpful in patients with thin atrophic damaged skin.

For preservation over the past 2 years, I have also made some important changes.

1. I have shifted back to using a 3-mm osteotome to remove the banana-shaped bone strip to execute a "letdown." Initially, I used a push-down, then changed to a letdown, taking out the bone strips using a high and then low cut along the ascending process of the maxilla. I then shifted to using a narrow rongeur to take out the bone strip. Using the rongeur was not as reliable as, in some cases, irregular bone segments were removed. Approximately two years ago, I shifted back to using the 3-mm osteotome to make a high cut, then a low cut on the ascending process of the maxilla to take out a banana-shaped bone strip (**Fig. 19**). Using this technique, I can remove a more consistent segment of bone. This can be a difficult maneuver, so I have also recently developed the banana strip osteotome/gouge(Marina Medical Instruments Inc., Davie, Fla.). This instrument has a left and right-sided version that allows the removal of a bone strip along the ascending process of the maxilla.
2. As noted earlier, I have increased the use of the subdorsal cantilever graft. It is also very effective for reconstructing Asian patients who require the removal of a dorsal implant and immediate reconstruction using a costal cartilage graft.
3. Over the past two years, I have used dorsal preservation techniques for patients presenting with acute nasal trauma and nasal bone fracture. Instead of using an open reduction of the nasal fracture, I am performing a dorsal preservation technique (subdorsal Z-flap, Tetris, or low strip) to correct the deviation and reduce the dorsal hump. I have found this approach to be very effective and provides the patient with an acute nasal fracture with a straight nose with no dorsal hump (**Fig. 20**).
4. I have recently started to use the endonasal approach for select primary rhinoplasty patients. I use the polygon tip with dorsal preservation with ligament preservation as described by Baris Cakir.[6–8] I have found this technique to have a significant upside in certain primary cases. The primary advantage is the improved control over the supratip with less postoperative supratip swelling due to the preservation of Pitanguy's ligament. With the open structure rhinoplasty approach, I frequently need to inject the supratip with steroids to control the supratip break. With the endonasal polygon tip approach, the supratip position and lateral tip contour are improved with the preservation of Pitanguy's ligament and the scroll ligaments. Additionally, less cartilage grafting is needed as only a columellar strut is used to stabilize the nasal base. In this approach, I do not need a caudal septal extension graft or lateral crural strut grafts. Up to this point in time, I have been very selective in case selection choosing patients with favorable tip orientation (not cephalically positioned), slightly underprojected symmetric tip in need of tip rotation.

SUMMARY

Both structure rhinoplasty and preservation rhinoplasty are very important and effective approaches in rhinoplasty. Structure rhinoplasty is the only viable option for most revision rhinoplasty cases. There are occasional revision cases where dorsal preservation can be used but these are not common.

For primary rhinoplasty, one can use a hybrid approach using dorsal preservation in the upper two-thirds of the nose and structure in the nasal tip (lower third). This hybrid structural preservation rhinoplasty is and will continue to be a powerful option.

I believe the transition to the endonasal approach with the polygon tip and related techniques will continue to increase in popularity as surgeons recognize the benefits.

This is an exciting time in rhinoplasty as a monumental shift is occurring with the preservation movement. As more surgeons take up this philosophy, outcomes will likely improve, and both the patient and surgeon will benefit.

CLINICS CARE POINTS

- Structure rhinoplasty is most appropriate for secondary rhinoplasty.
- Preservation rhinoplasty is most appropriate for primary rhinoplasty patients.

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