Techniques in
Cosmetic Surgery

Component Dorsal Hump Reduction: The Importance of Maintaining Dorsal Aesthetic Lines in Rhinoplasty

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Dorsal hump reduction can create both functional and aesthetic problems if performed incorrectly. Component dorsal hump reduction allows a graduated approach to the correction of the nasal dorsum by emphasizing the integrity of the upper lateral cartilages when performing dorsal reduction. Use of this approach can minimize the need for spreader grafts in primary rhinoplasty patients. Possible untoward sequelae of dorsal hump reduction include long-term dorsal irregularities caused by uneven resection or overresection or underresection of the osseocartilaginous hump irregularity; the inverted-V deformity; and excessive narrowing of the midvault. The component dorsal hump reduction technique is a five-step method: (1) separation of the upper lateral cartilages from the septum, (2) incremental reduction of the septum proper, (3) dorsal bony reduction, (4) verification by palpation, and (5) final modifications (spreader grafts, suturing techniques, osteotomies). A graduated approach is described that offers control and precision at each interval. Fundamental to the final outcome is the protection and formation of strong dorsal aesthetic lines that define the appearance of the dorsum on frontal view. Furthermore, preservation of the transverse portions of the upper lateral cartilages is essential to maintain patency of the internal nasal valve, maintain the shape of the dorsal aesthetic lines, and avoid the inverted-V deformity. Finally, if needed, spreader grafts are enormously adaptable and can be customized for any deformity (unilateral or bilateral, visible or invisible) to handle functional or aesthetic problems. (*Plast. Reconstr. Surg.* 114: 1298, 2004.)

An aesthetically pleasing dorsal nasal profile is a sine qua non for a successful rhinoplasty result. We offer a reproducible and graduated component dorsal hump reduction technique that has been developed over several years that takes into consideration anatomic, aesthetic, and functional relationships.

Aesthetics of the Nasal Dorsum

To achieve the optimum result, the rhinoplasty surgeon must individualize each procedure to the patient. This must take into account the patient's anatomy (including deformities), ethnicity, sex, and personal desires. Established canons of nasofacial aesthetics should be used as guidelines.[1] Preoperative counseling and proper nasofacial analysis are paramount to obtaining the best result. As part of the nasofacial analysis, one must note the course of the dorsal aesthetic lines, which may need to be either defined or manipulated during dorsal modification. The dorsal aesthetic lines originate on the supraorbital ridges and pass medially along the glabellar area to converge at the medial canthal ligaments. From there, they usually begin diverging at the keystone area and ultimately conclude at the tip-defining points. In any given patient, the dorsal aesthetic lines may or may not need modification because of asymmetry, excessive width, excessive narrowness, or poor definition. Ideally, the width of the dorsal aesthetic lines should match either the interphiltral distance or the width of the tip-defining points (Fig. 1).

One should also evaluate the width of the bony base of the osseocartilaginous vault while performing nasofacial analysis in the frontal

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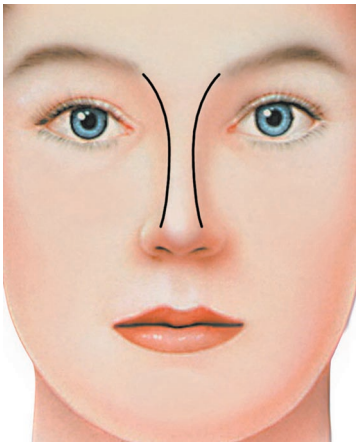

FIG. 1. The ideal dorsal aesthetic lines originate on the supraorbital ridges and conclude at the tip-defining points. Ideally, their width should match either the interphiltral distance or the width of the tip-defining points.

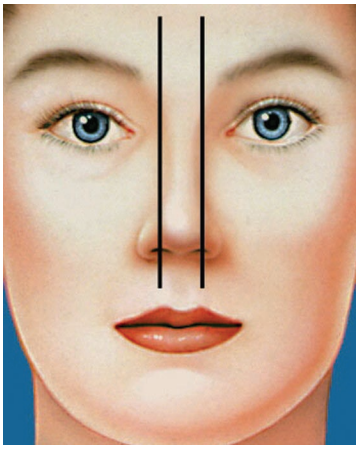

FIG. 2. Ideally, the width of the bony base should be approximately 80 percent of the alar base width.

view. Ideally, the width of the bony base should be approximately 80 percent of the alar base width (Fig. 2). The alar base width is also equal to the intercanthal distance. Thus, if the bony base width is greater than 80 percent of the intercanthal distance, osteotomies may be indicated.

On the lateral view, the nasofacial analysis begins at the nasofrontal angle. This angle is formed by the intersection of a line drawn parallel to the infrabrow glabella and a line drawn as a superior extension of the nasal dorsum (Fig. 3). The ideal angle varies by gender, with a more obtuse angle of 134 degrees acceptable in female patients versus 130 degrees in male patients.[2] Of course, this can vary by ethnicity as well. The apex of the angle should be positioned between the upper lid lashes and the supratarsal fold, which essentially corresponds with the nasion. The nasion should ideally be positioned approximately 15 mm anterior to the level of the medial canthus and 11 mm anterior to the corneal plane.

It is important to note that the perceived length and projection of the nose can be influenced by the nasofrontal angle.[2] For instance, the nose may appear artificially more elongated, and tip projection diminished, if the nasofrontal angle is positioned more anteriorly and superiorly than normal (Fig. 4, *yellow line*). In contrast, the nose can be made to appear shorter (i.e., a more projecting tip) if the nasofrontal angle is positioned more posteriorly and inferiorly (Fig. 4, *red line*).

While still concentrating on the lateral view, the size of any dorsal hump irregularity must be noted, in addition to whether it is strictly osseous, osseocartilaginous, or cartilaginous only. Tip projection and tip rotation are also assessed using analysis and proportions previously described in the literature.[1]

Finally, from the lateral view, the entire dorsum from radix to tip-defining points must be assessed. In male patients, the dorsum should be equal to a line drawn from the radix to the tip-defining points. In female patients, however, the dorsum should be along a line approximately 2 mm more posterior, but still parallel.

Underlying Anatomy

As with any procedure in plastic surgery, a thorough understanding of the underlying anatomy is imperative. Starting with the skin, it is important to realize that the thickness of the skin of the nasal dorsum varies: it is thinner cephalically and thicker toward the tip. Therefore, a straight dorsal profile actually depends on the combination of this variation in dorsal skin thickness and a slight underlying convexity of the osseocartilaginous framework. This should be taken into account when modifying this underlying framework (Fig. 5).

With respect to the anatomy of the nasal dorsum, it is important to understand the "keystone" area and the "scroll" area. The keystone area is created by the junction of the upper lateral cartilage with the nasal bones and the septum (Fig. 6), and should be the widest part of the dorsum. In this region, the relationship of the upper lateral cartilage to the septum is critical, contributing to the T-shaped contour of the dorsum. This

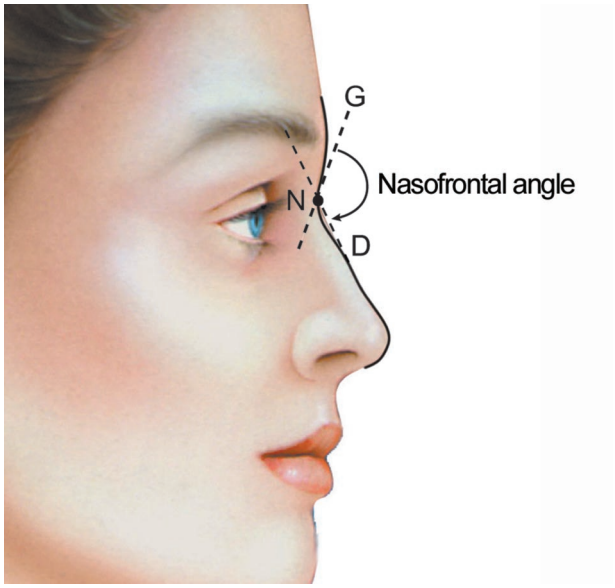

FIG. 3. The nasofrontal angle is defined by the glabella limb (*G*) and the dorsal limb (*D*) that intersect at the nasion (*N*).

contour of the nasal dorsum, in particular, its keel-shaped segment, must be maintained or reconstructed in rhinoplasty or nasal reconstruction. The scroll area refers to the area where the lower lateral cartilages overlap the upper lateral cartilages for 4 to 6 mm.

OPERATIVE TECHNIQUE

Generally, if the patient has an isolated dorsal hump, a closed or endonasal approach is preferred. However, if more aggressive modifications to the nose are necessary, we tend to favor the open approach.[3,4] Guided by a precise preoperative clinical analysis as previously described, we perform the initial modification of the dorsum before addressing the tip correction. This order of operations establishes the balance between the tip and the dorsum that is crucial to an optimal aesthetic result. In the component reduction of the osseocartilaginous hump, five essential steps are followed: (1) separation of the upper lateral cartilage from the septum; (2) incremental reduction of the septum proper; (3) incremental dorsal bony reduction (using a rasp); (4) verification by palpation; and (5) final modifications, if indicated (spreader grafts, suturing techniques, osteotomies).

Separation of the Upper Lateral Cartilage from the Septum Proper

After the nasal dorsum is undermined, it is essential to create bilateral submucoperichondrial tunnels before beginning the actual component reduction of the dorsal hump.[5–7] The mucoperichondrium of the dorsal septum is elevated, from caudal to cephalad, until the elevator reaches the nasal bones (Fig. 7). Then, the upper lateral cartilage can be sharply separated from the junction with the septum without damaging the mucosa. By preserving the mucosa, the potential for late cicatricial narrowing of the internal nasal valve is minimized and webbing of the vestibule is prevented.[8] Furthermore, if needed, spreader grafts can then be placed in this closed space that is separated from the nasal cavity. Preservation of mucosal integrity also contributes to greater overall stability after septal reconstruction.

Incremental Component Dorsal Septal Reduction

Once the submucoperichondrial tunnels have been made and the transverse portions of the upper lateral cartilage have been separated from the septum using a no. 15 scalpel, the graduated component dorsum reduction can be performed. At this point, the cartilaginous dorsum is in three separate pieces, the septum centrally and the trans-

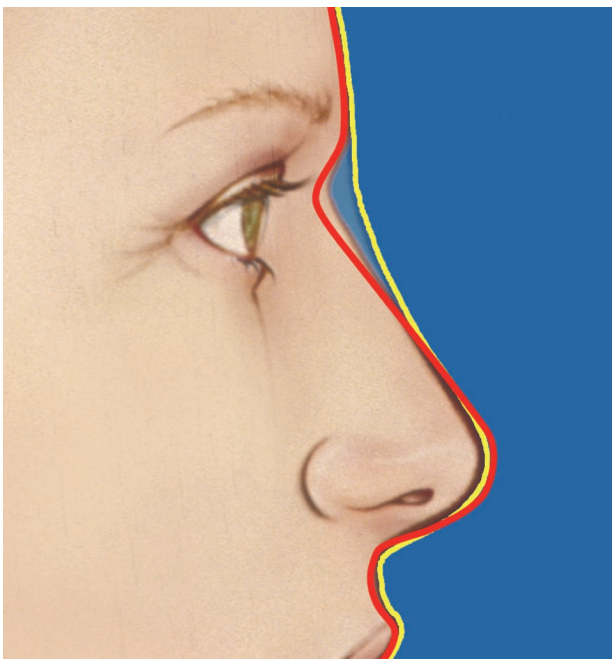

FIG. 4. The appearance of the nose can be altered by the position of the nasofrontal angle. The nose will appear more elongated if the nasofrontal angle is more anterior and superior (*yellow line*) versus shorter if the nasofrontal angle is more posterior and inferior (*red line*).

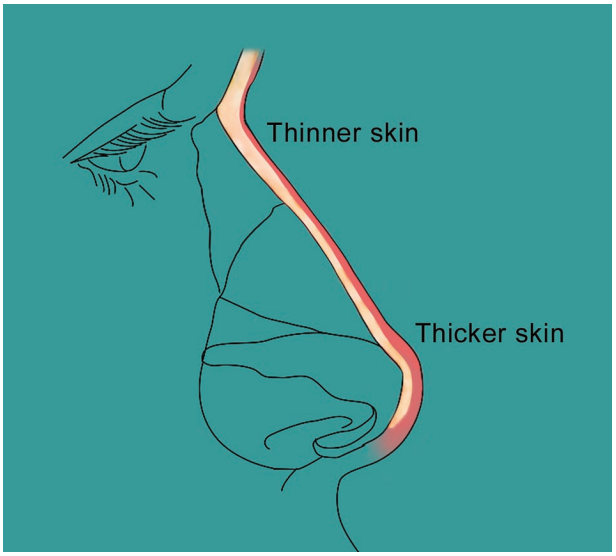

FIG. 5. The variable thickness of the nasal dorsal skin combined with the underlying convexity of the osseocartilaginous framework creates a straight dorsal nasal profile.

verse portions of the upper lateral cartilage laterally. Hump reduction initially begins with serial incremental resections of the central septal cartilage with either a scalpel blade or angled septal scissors. This is performed under direct vision. A key principle here is equal or less resection of the upper lateral cartilage with respect to the septum, which results in a rounding of the dorsum (Fig. 8). Excessive resection of the upper lateral cartilage as compared with the septum results in the inverted-V deformity.[8]

Component Bony Dorsum Reduction

After the cartilaginous hump has been carefully reduced, the bony deformity is addressed. A sharp, down-biting diamond rasp is used to reduce the osseous hump. Reduction of small and medium humps (i.e., 3 mm or less) can usually be accomplished with incremental rasping, which is performed at a slightly oblique bias to minimize the risk of avulsion of the upper lateral cartilages from beneath the nasal bones. Rasping should proceed in a methodical fashion—first along the left and right dorsal aesthetic lines, and then centrally using controlled, short rasp excursions. For larger bony humps, a guarded osteotome or a power burr with a dorsal skin protector may be used, followed by rasping to smooth out residual irregularities.

Only after the reduction of the septal cartilaginous and bony dorsal components of the hump is reduction of the upper lateral cartilage considered, and then performed only if necessary. It is essential to avoid overresection of the upper lateral cartilage to prevent internal nasal valve collapse and long-term irregularity of the dorsum. Maintaining the transverse portions of the upper lateral cartilage also preserves the dorsal aesthetic lines, permitting any necessary narrowing or straightening of the lines. Furthermore, when they have been appropriately preserved, the transverse portions of the upper lateral cartilage act as "auto-spreader grafts," maintaining the integrity of the internal valves.[7]

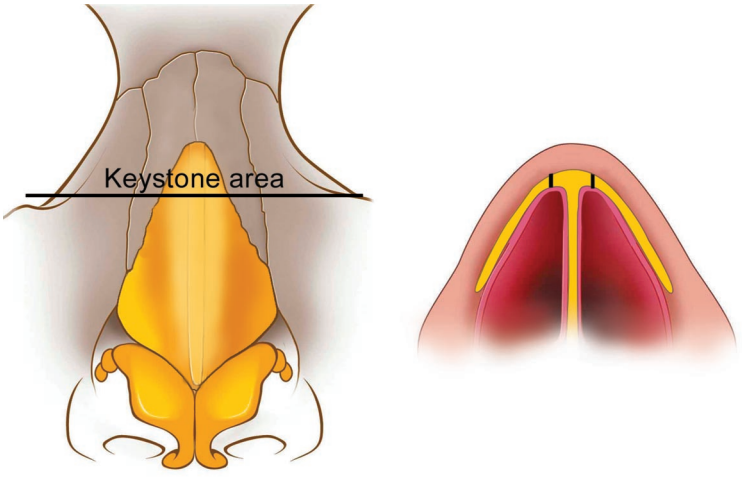

FIG. 6. The keystone area is the widest part of the dorsum, and is T-shaped in cross-section.

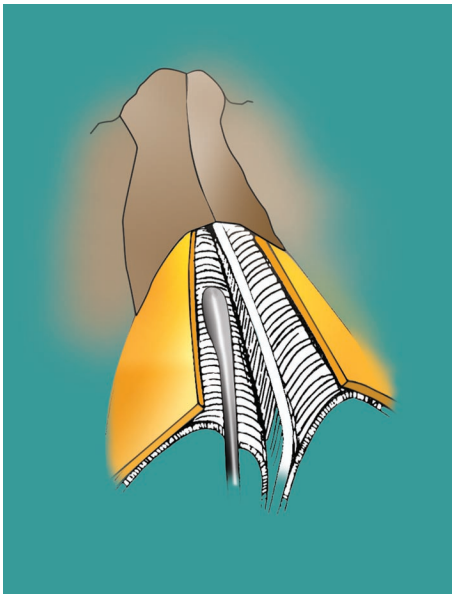

FIG. 7. Creation of submucoperichondrial tunnels.

Verification by Palpation

Throughout the dorsal reduction procedure, the repeated use of dorsal palpation after each modification of the dorsum is crucial. We perform this "three-point palpation test" with the dominant index fingertip moistened with saline to decrease the coefficient of friction and allow a smooth appreciation of the result. The fingertip gently palpates both the left and right dorsal aesthetic lines, and then centrally to detect any contour abnormalities that may need to be addressed[5,6] (Fig. 9).

Final Modifications

If necessary, adjunctive procedures such as osteotomies, suture techniques, and/or spreader graft placement are performed. Placement of spreader grafts is indicated as follows[6,9–11]: (1) for maintenance or reconstruction of the dorsal nasal roof; (2) for maintenance or reconstruction of the internal nasal valves; (3) to straighten and buttress a high dorsally deviated septum; and (4) to recreate the dorsal aesthetic lines.

In primary rhinoplasty, however, spreader grafts are used principally to restore the dorsal aesthetic lines. If required, septal cartilage is harvested and the grafts fashioned into the appropriate length and width, which are typi-cally 5 to 6 mm in height and 30 to 32 mm in length.

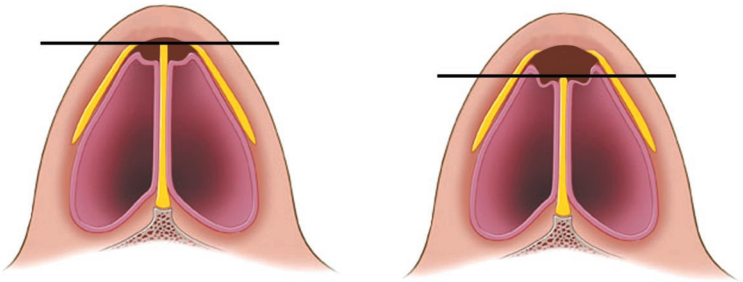

FIG. 8. Component reduction of the dorsal septum, with preservation of the upper lateral cartilage, which results in a rounding of the dorsum.

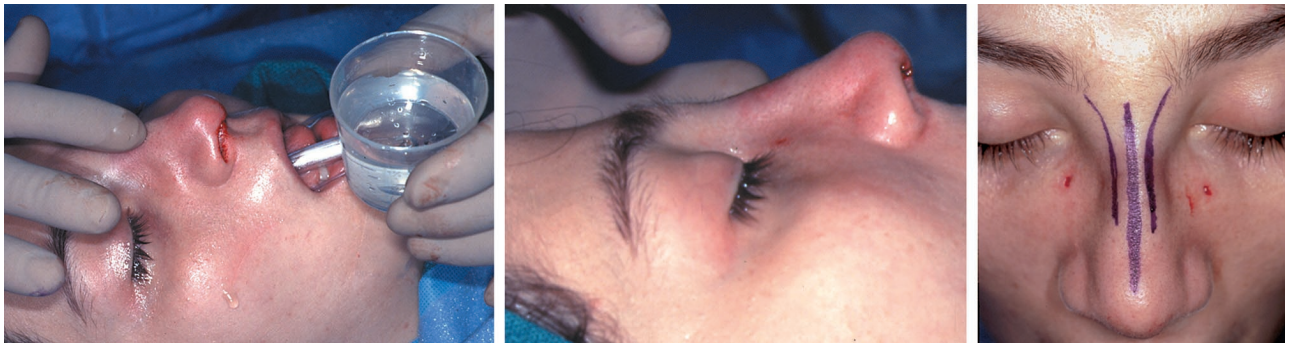

FIG. 9. Three-point dorsal palpation test.

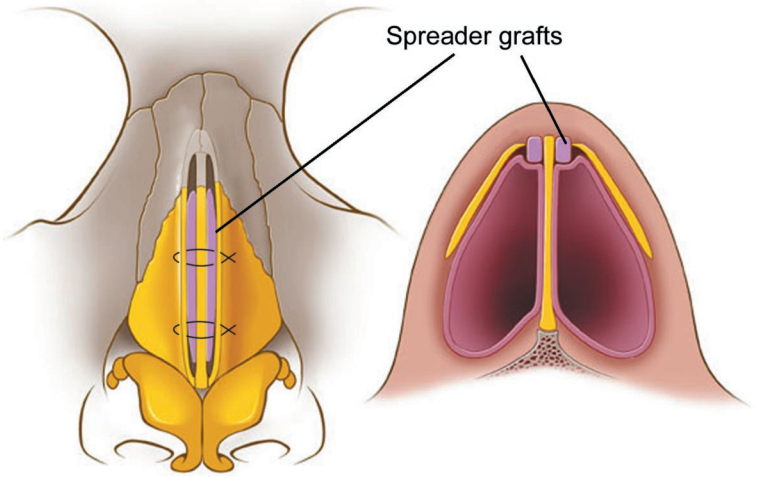

FIG. 10. Spreader grafts are placed adjacent to the septum on either a visible or an invisible position. The upper lateral cartilages are then reattached to the spreader graft/septal complex.

These grafts can be placed in any number of configurations. They may be placed unilaterally or bilaterally, and may be positioned above the septal plane (to be visible) or below it (invisible). Generally, if placed to be "visible," it is to more aggressively define a dorsal aesthetic line. We use horizontal mattress sutures of 5-0 polydioxanone to secure the grafts to the septum. The upper lateral cartilages are then reattached to the spreader graft/septal complex (Fig. 10).

Osteotomies are used primarily to correct widened nasal bones, to reposition asymmetric nasal bones, or to close an open roof deformity present after aggressive dorsal reduction. We prefer the lateral external perforated osteotomy technique, as it affords excellent control, stable long-term results, and shorter postoperative recovery time than intranasal osteotomies in our hands. Significantly decreased trauma to the nasal mucosa has been noted in cadaver studies using this transcutaneous technique. Further description is outside the scope of this article[12–14] (Fig. 11).

FIG. 11. Technique of transcutaneous perforated lateral osteotomy.

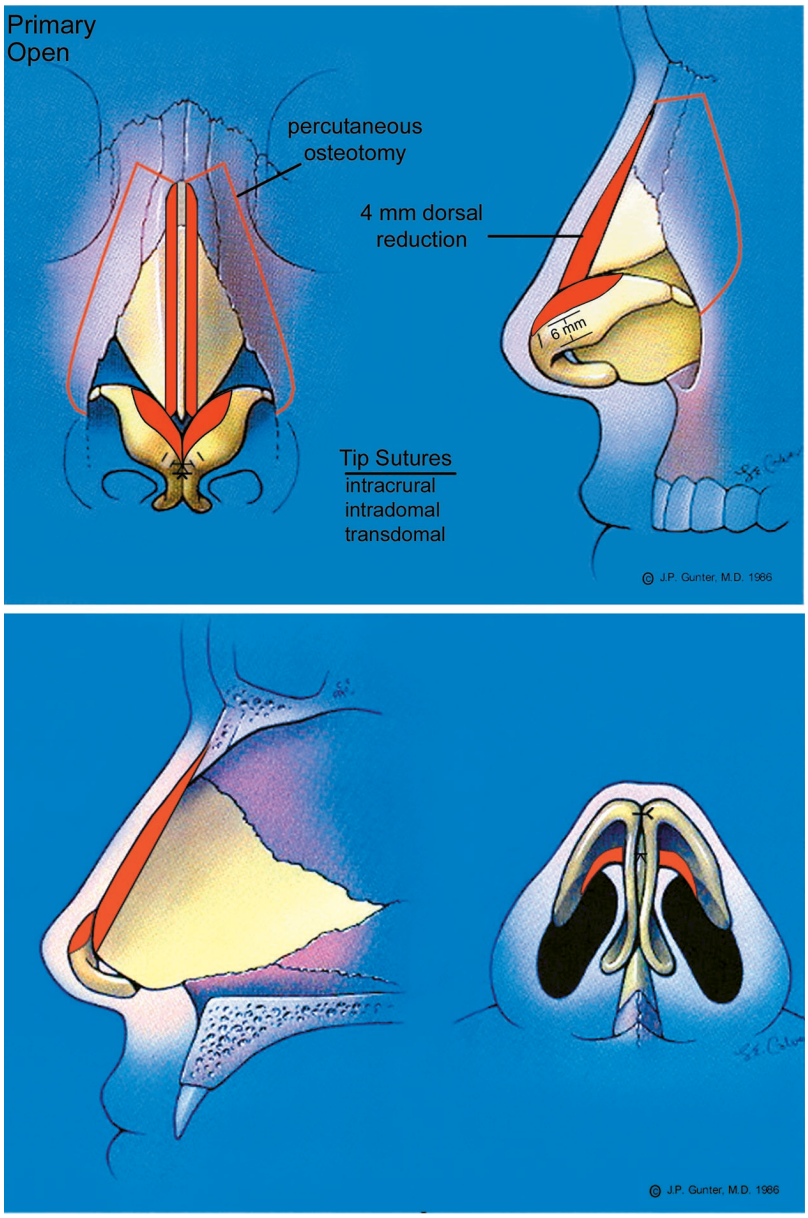

FIG. 12. Surgical plan of the patient in case 1.

CASE REPORTS

Case 1

A healthy 19-year-old white woman presented with a dorsal hump, an accentuated supratip break, and a wide bony base. The frontal view demonstrated a slightly widened middle vault. The lateral view demonstrated a moderate dorsal hump with an accentuated supratip break. The operative goals were to reduce the dorsal hump, narrow the bony base, and maintain symmetry of the dorsal aesthetic lines.

The surgical plan involved (1) an open approach with a transcolumellar stairstep incision connected to bilateral infracartilaginous incisions (Fig. 12); (2) component reduction of the dorsum (4 mm); (3) cephalic trim leaving a 6-mm rim strip; (4) intercrural, interdomal, and transdomal suturing; and (5) low-to-low percutaneous osteotomies.

Comparison views of the patient's preoperative (Fig. 13, *left*) and 6-month postoperative (Fig. 13, *right*) appearance demonstrate correction of the dorsal hump with preservation of symmetric dorsal aesthetic lines, a more gradual supratip break, a narrower bony base, and well-defined tip-defining points (Fig. 13).

FIG. 13. Preoperative and postoperative views of the patient in case 1.

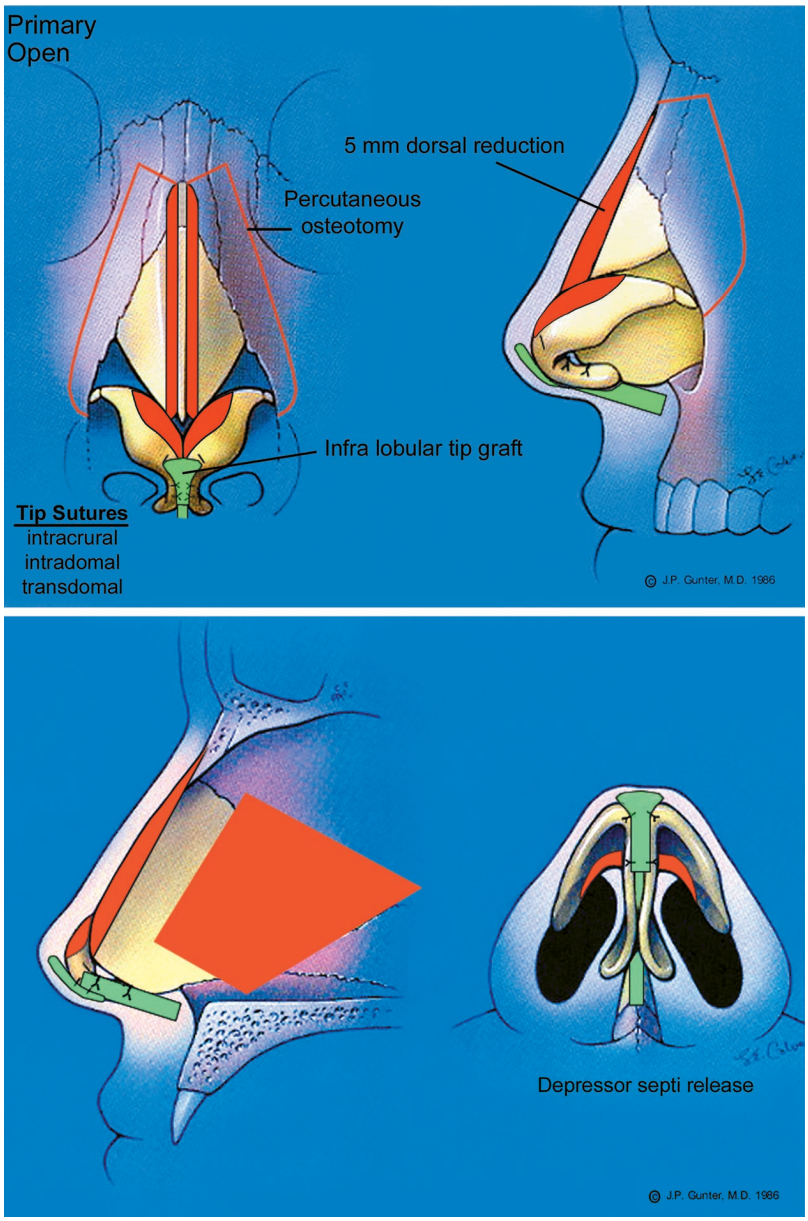

FIG. 14. Surgical plan of the patient in case 2.

Case 2

A healthy female patient presented with a history of nasal airway obstruction, septal deviation, a dorsal hump, and an active depressor septi. The frontal view demonstrated obvious dorsal-to-caudal rightward septal deviation with deviated dorsal aesthetic lines and tip-defining points, and a slightly widened bony base. She appeared to have an active depressor septi muscle on dynamic examination. The lateral view demonstrated moderate dorsal hump, and the appearance of an elongated nose secondary to the anterior radix position. Internal nasal examination revealed a septal tilt, with left dorsal septal deviation and right caudal septal deviation, in addition to compensatory left inferior turbinate hypertrophy.

The operative goals were to straighten the dorsum, recreate symmetric dorsal aesthetic lines; correct/preserve the internal nasal valve, reduce the dorsal hump, increase tip projection to overcome the appearance of an elongated nose, release the active depressor septi, and correct the inferior turbinate hypertrophy.

The surgical plan involved (1) an open approach with a transcolumellar stairstep incision connected to bilateral infracartilaginous incisions (Fig. 14); (2) component reduction of the dorsum (5 mm); (3) septal cartilage harvest leaving an L-strut; (4) centering and securing of the caudal septum onto the anterior nasal spine; (5) cephalic trim leaving a 6-mm rim strip; (6) a columellar strut; (7) intercrural, interdomal, and transdomal suturing; (8) an infralobular tip graft for projection; (9) submucous resection and outfracturing of the inferior turbinates; (10) low-to-low percutaneous osteotomies; and (11) depressor septi release.

Comparison views of the patient's preoperative (Fig. 15, *left*) and 12-month postoperative (Fig. 15, *right*) appearance demonstrate correction of the deviation with redefinition of symmetric dorsal aesthetic lines, correction of the dorsal

FIG. 15. Preoperative and postoperative views of the patient in case 2.

hump, narrowing of the bony base, and refinement of the tip (Fig. 15). Of note, the dynamic examination did not demonstrate a plunging tip, and her subjective complaints of nasal airway obstruction resolved.

DISCUSSION

A straight, smooth dorsum is crucial to a good result in rhinoplasty. A thorough understanding of the underlying anatomy and precise preoperative nasofacial analysis are fundamental. Significant morbidity may occur from inaccurate dorsal hump reductions without proper consideration of the significant anatomic, aesthetic, and functional relationships of the nasal dorsum. Potential complications of improper dorsal hump reduction include long-term dorsal irregularities caused by uneven resection, overresection, or underresection of the osseocartilaginous hump irregularity, the inverted-V deformity, and excessive narrowing of the midvault.[8,11]

A technique for graduated component dorsal hump reduction has been developed to minimize the occurrence of these three common sequelae of imprecise dorsal hump reduction. A reproducible aesthetic nasal dorsum

correction is possible with the following five critical steps: (1) separation of the upper lateral cartilage from the septum; (2) incremental reduction of the septum proper; (3) dorsal bony reduction; (4) verification by palpation; and (5) final modifications.

The keys to this technique are the formation of bilateral submucoperichondrial tunnels before sharp separation of the upper lateral cartilage from the central septum and a graduated approach to dorsal hump reduction starting with the cartilaginous septal hump followed by the bony hump. This allows maximal preservation of the integrity of the upper lateral cartilages and preservation of the mucosa of the internal valves, which helps prevent cicatricial stenosis and subsequent nasal airway obstruction. The preserved transverse portions of the upper lateral cartilage can therefore function as "auto-spreader grafts" to maintain the patency of the internal nasal valve. Furthermore, their role in creating and maintaining the dorsal aesthetic lines is crucial to the aesthetics of the nasal dorsum.

Described by Sheen,[9] the inverted-V deformity is often attributed to avulsion of the upper lateral cartilages; however, this deformity is often caused by excessive removal of the transverse portion of the upper lateral cartilage during dorsal septal resection. When the transverse portion of the upper lateral cartilage is overresected, collapse of the nasal sidewalls occurs with retraction of the upper lateral cartilage and exposure of the shape of the nasal bones in the keystone area. In this case, spreader grafts fashioned from septal cartilage can be used to correct this deformity. Spreader grafts can also restore an open roof deformity after aggressive hump reduction and recreate the dorsal aesthetic lines while simultaneously maintaining patency of the internal valve. These versatile grafts can be placed unilaterally or bilaterally, visible or invisible, depending on the deformity and the desired result.[6,7,9–11]

With careful attention to the anatomic nuances of the nasal dorsum, dorsal hump reduction can be performed with predictable accuracy and safety. A smooth, straight dorsum must be achieved without compromising the nasal airway. A graduated approach using our component dorsal hump reduction technique results in an optimal aesthetic correction of the nasal dorsum while preventing or minimizing the most common adverse outcomes of this procedure.

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