Management of the Wide Nasal Dorsum

Monte O. Harris, MD; Shan R. Baker, MD

The literature is replete with discussions outlining surgical techniques for managing nasal tip deformities. In contrast, articles devoted to specific dorsal nasal abnormalities are rare. Surgical management of the nasal dorsum has traditionally been relegated to either augmentation or reduction followed by osteotomy. Contemporary rhinoplasty demands attention to the creation of an ideal profile line, which may require dorsal reduction in some areas and augmentation in others. Treatment of the patient with an appropriate projection of the profile but with a wide nasal dorsum presents a special challenge: to narrow the nasal bridge without altering its projection. We discuss several surgical techniques to narrow the nasal dorsum, while maintaining dorsal height. Selected cases are presented to illustrate these techniques and to clarify surgical options.

The nasal dorsum is an osseocartilaginous unit that is separated anatomically into a bony (upper) vault and a cartilaginous (middle) vault. The bony vault is primarily composed of the nasal bones, with a smaller contribution from the bony septum. The cartilaginous vault is formed by the septal cartilage, which is fused to the upper lateral cartilages. The midline junction of the bony and cartilaginous vaults is known as the keystone of the nasal bridge. Anatomically, the bony pyramid is continuous with the cartilaginous middle vault. Likewise, the bony septum is continuous with the cartilaginous septum, which is fused to the upper lateral cartilages. The nasal bones are continuous with the upper lateral cartilages, which together form the sidewalls of the nose. Each component of the nasal bridge contributes to its width. Excess width may occur if any of the components are overdeveloped. For example, the nasal bones may form a widened plateau or have excessive lateral convexity, creating a broad bony vault. In other cases, the cross-sectional

“T” configuration of the junction of the bony septum with the nasal bones may be sufficiently thick to widen the dorsum. Similarly, a wide cartilaginous vault may arise from a thick cartilaginous septum or from upper lateral cartilages that display prominent horizontal angulation or square shoulders. By identifying the anatomical components that contribute to a wide nasal dorsum, a surgical approach may be developed to selectively address the causative factors.

The width of the nasal bridge is assessed on frontal view using both dorsal aesthetic lines as a reference. Ideally, these lines gently curve from the medial borders of the eyebrows to the level of the rhinion and then diverge slightly to the tip-defining points. The degree of separation of the lines denotes the nasal bridge width. Ultimately, the ideal width of the nasal bridge is influenced by ethnic origin; however, it is generally accepted to be 6 to 8 mm in white women and 8 to 10 mm in white men.

The nasal profile is analyzed on lateral view. Length is measured from nasion to tip and ideally measures 45 mm in women and 49 mm in men. Dorsal height is synonymous with dorsal projection. We assess nasal projection using a 10:20:30 ra-

From the Section of Facial Plastic and Reconstructive Surgery, Department of Otolaryngology–Head and Neck Surgery, Georgetown University, Washington, DC (Dr Harris); and the Division of Facial Plastic and Reconstructive Surgery, Department of Otolaryngology–Head and Neck Surgery, and the Center for Facial Cosmetic Surgery, University of Michigan, Livonia (Dr Baker).
Figure 1. Algorithm for managing the wide nasal dorsum without reducing dorsal projection. A. Wide bony vault. B. Wide middle vault. ULC indicates upper lateral cartilages.

Figure 2. A. Unilateral bony septal thickening is reduced to narrow the bony vault before osteotomies are performed. B. Deviated bony septum may require complete mobilization.

to determine whether augmentation, reduction, or preservation is indicated in creating an ideal profile line. Our measurements are taken from the anterior plane of the cornea and the vertical facial plane, which is a perpendicular line that runs through the alar facial sulcus. Ideally, the nasion measures 10 mm from the corneal plane. The keystone area of the rhinion ideally projects 20 mm and the tip 30 mm from the vertical facial plane.

Sheen and Sheen\(^1\) suggest that management of the broad dorsum is primarily a technical problem in determining the best way to narrow the nose, while preserving the nasal roof. The challenge arises in those patients with a wide dorsum and an ideal projection of the dorsal line. Traditionally, to narrow the nose, surgeons have relied on dorsal reduction to open the nasal roof for subsequent infracturing of the bony sidewalls. This approach enables the surgeon to narrow the nasal bridge, but at the cost of losing dorsal height. To avoid this dilemma, it is necessary to create an open roof without sacrificing dorsal height. Sheen and Sheen recommend removal of the shoulders of bone and of cartilage the length of the bony and cartilaginous vaults at the junction of the dorsum and sidewalls. Daniel\(^2\) addresses this problem by performing wedge excisions of cartilage from either side of the septum to create an open roof without reducing septal height. Lateral osteotomies, which have the effect of narrowing the nasal bridge with minimal or no loss of dorsal height, are then completed. Frenivalle et al\(^3\) recommends removing portions of the upper lateral cartilages in the paramedian position to narrow the cartilaginous vault. This method, which in essence is a reverse spreader technique, is a useful alternative to dorsal augmentation, which creates the illusion of a narrower nasal bridge.\(^4\)

Our surgical approach adheres to the principles of Sheen and Sheen and Daniel for management of the wide nasal dorsum. An algorithm is provided to assist the surgeon in selecting the preferred method of narrowing the dorsum in situations in which changes of the projection of the dorsal line are not desirable (Figure 1). Under these circumstances, an open rhinoplasty approach is always used. The surgical techniques are used to correct the anatomical factors that are responsible for the excessively wide nasal bridge.

METHODS

**WIDE BONY VAULT**

Excision of the Bony Septum

Excision of portions of the bony septum is indicated in cases in which the superior bony septum is sufficiently thick or deviated to cause a wide bony vault. This situation may confront the surgeon when an open roof has been created, but the bony septum prevents mobilization of the bony sidewalls medially. Occasionally, a spur or unilateral thickening of the bony septum is encountered that requires removal to facilitate medialization of the ipsilateral nasal bone (Figure 2). In other instances, a marked deviation of the bony septum may prevent adequate medialization of one or both nasal bones after osteotomy. A severely deviated bony septum may require a complete fracture of the nasal septum and mobilization toward the midline (Figure 2). Rarely, surgical removal of the anterior bony septum cephalic to the keystone area may be necessary to achieve adequate narrowing of the bony vault.

Through an open approach, the nasal skin is elevated and an incision is made through the mucoperichondrium at the anterior septal angle. A mucoperichondrial flap is then elevated
on both sides of the cartilaginous septum, continuing posteriorly to elevate the mucoperiosteum from the bony septum. The dissection is carried anteriorly to the junction of the septum and upper lateral cartilages. In a submucosal plane, the upper lateral cartilages are separated from their attachments to the dorsal septum, exposing the thick bony septum beneath the nasal bones. The submucosal dissection is continued posteriorly, elevating the mucoperiosteal flaps bilaterally from the bony septum. The septum is removed using an osteotome or bone-cutting rongeurs, with care being taken not to perforate the mucoperiosteal flaps. The bony septum between the nasal bones may be completely removed if necessary to infracture the nasal bones sufficiently to narrow the bony vault. More anteriorly, it is important to maintain a continuous strip of bony septum from the keystone area to the volar to provide support for the cephalic portion of the cartilaginous dorsum. Transverse and low-to-low lateral osteotomies are performed, and the nasal bones are infracted.

Excision of Nasal Bone

Wedge-shaped excisions of nasal bone in the paramedian positions are required when the bony vault is of appropriate height and the nasal bones have a marked horizontal orientation, giving a broad, flat roof to the vault. When the nasal septum is also thick, it must be thinned at the same time (Figure 3). In these situations, an open roof is created by excision of paramedian bone wedges immediately adjacent to the bony septum and the central portion of the roof, which maintains the height of the bony vault. The open roof enables infracturing of the nasal sidewalls, which narrows the bony vault.

An Aufricht retractor is used to retract the nasal skin. Skin and peristeum covering the nasal bones are elevated together. Bilateral triangular-shaped bone segments, with their bases positioned caudally, are excised using a sharp 2-mm osteotome positioned alongside the bony septum. A second cut, positioned more laterally, is angled toward the apex of the initial cut, removing a wedge of nasal bone (Figure 4). Typically, the base of the wedge is 2 mm wide; however, the size of the wedge is dependent on the width of the bony vault and the degree of nasal narrowing desired. Wider wedges allow greater narrowing.

Wedge excisions that are unequal in size or unilateral may be necessary to correct asymmetry or marked deviations of the bony vault. In cases involving long-standing bony deviations, a more lateral osteotomy is performed ipsilateral to the side of deviation. This facilitates repositioning of the nasal bones toward the midline.

Nasal Bone Contouring

Contouring the nasal bones and the superior aspect of the ascending processes of the maxillae with a drill is performed in cases in which a wide bony vault is the result of thick bone composing the bony sidewalls. In rare instances, the bony sidewalls may be sufficiently thick to enable narrowing the bony vault solely with a drill, making osteotomies unnecessary. In the majority of cases, however, in addition to drill contouring, the nasal roof must be opened by excising paramedian bone wedges to mediatize the bony sidewalls. In some instances, a wide bony vault is predominantly attributable to excessively convex bony sidewalls. If the bone is sufficiently thick, a drill may be used to reduce the convexity. If the nasal bones do not have ample thickness to permit drill contouring without full-thickness penetration of the bone, an osteotomy is performed at 2 levels to address the excessively convex lateral walls. In this situation, in addition to the transverse (medial) and lateral osteotomies, a third osteotomy is performed in the intermediate position between the medial and lateral bone cuts. The transverse osteotomy is performed first, followed by the intermediate osteotomy and then the lateral osteotomy. The bone segments are then mobilized medially to reduce the convex contour.

Osteotomy

In most cases, lateral osteotomy is the final common pathway for achieving narrowing of the bony vault. The 2 types of lateral osteotomy are the low-to-low osteotomy and the low-to-high osteotomy. In a low-to-low osteotomy, the osteotome passes entirely within the ascending process of the maxilla, along a line corresponding to the junction of the nasal sidewall and cheek. A low-to-high osteotomy traverses diagonally across the ascending process of the maxilla, to terminate at the suture line between nasal bone and maxilla.

When the width of the bony vault is primarily related to transverse expansion of the caudal aspect, it is easier to narrow the vault with a low-to-high osteotomy. In contrast, when excess width of the bony vault is contributed to by a wide expanse of bone superior to the level of the inferior bony orbital rim, narrowing becomes more difficult. In such circumstances, a low-to-low osteotomy is indicated. It maintains the line of the osteotomy posteriorly, so that a greater portion of the ascending process is included in the section of bony sidewall that is moved medially with the osteotomy.

The senior author (S.R.B.) prefers a percutaneous approach for lateral osteotomy using a 2-mm straight osteotome. The skin over the lateral nasal wall is penetrated with
the osteotome in 2 locations along the planned line of osteotomy. Multiple stepwise bone cuts are made along the intended line of osteotomy by advancing the osteotome beneath the skin. Use of the narrow, straight osteotome creates minimal soft tissue trauma and bleeding and does not leave a perceptible scar.

WIDE CARTILAGINOUS VAULT

Thinning of the Cartilaginous Septum

The cartilaginous septum may be sufficiently thick at its junction with the upper lateral cartilages to cause a wide cartilaginous vault. The upper lateral cartilages are detached from the septum by first elevating the bilateral mucoperichondrial flaps in a similar fashion to that described for modification of the bony septum. The cartilaginous septum is thinned by shaving cartilage from either side, while maintaining its height. This procedure narrows the dorsal septum, enabling reattachment of the upper lateral cartilages to the septum in a more medial position. This step, in turn, has the effect of narrowing the width of the middle vault. Reducing the thickness of the cartilaginous septum without reducing septal height has the reverse effect of spreader grafts.

Excision of Upper Lateral Cartilage

Similar to the bony vault, where the surgeon may encounter horizontally oriented segments of the nasal bones that account for a broad bony dorsum, a comparable finding may be seen in the cartilaginous vault. The axis of the medial aspect of the upper lateral cartilages may be angled horizontally, causing a broad dorsum without an abnormally thick septum. In these instances, rectangular-shaped excisions of the cartilaginous roof lateral to the septum is an effective way to narrow the cartilaginous vault without changing projection of the dorsal line (Figure 5). The nasal roof is exposed through an open rhinoplasty approach. The upper lateral cartilages are detached from the septum, and a rectangular portion of cartilage is excised from their medial border. They are then reattached to the septum with horizontal mattress sutures. Unilateral excision or resection of cartilage segments of unequal width may be necessary to correct asymmetries of the cartilaginous vault.

Excision of the Anterolateral Wall

In cases in which the cartilaginous vault is wide because of square shoulders at the junction of the dorsum and sidewall, limited excision of cartilage in this area may be indicated. After the nasal skin is elevated, a full-thickness linear strip of cartilage along the shoulder is removed with a No. 11 surgical blade or straight iris scissors. This maneuver creates a cartilaginous void and enables the sidewall to move inward, narrowing the dorsum and creating an oblique slope to the transition between dorsum and sidewall. Often, bony and cartilaginous vaults require narrowing together, so this technique is typically performed in conjunction with contouring of the anterolateral aspect of the bony vault with a drill.

Suture Contouring

In some instances, the cartilaginous vault is wide because of marked lateral convexity of the upper lateral cartilages. Detaching the upper lateral cartilages from the septum disrupts their intrinsic spring and may have the effect of reducing convexity. The cartilages are reattached using horizontal mattress sutures in such a way that the convexity is reduced but the integrity of the cartilaginous vault is maintained. This technique is only useful in cases in which the upper lateral cartilages are sufficiently flexible that when they are reattached to the septum, the excessive convexity does not recur.

ILLUSTRATIVE CASES

CASE 1

A 28-year-old woman presented with a broad osseocartilaginous vault. She had adequate dorsal projection and slight convexity of the nasal profile. The broad nasal bridge was attributed to a horizontal orientation of the roof of the bony and cartilaginous vaults. The surgical goal was to maintain dorsal height and narrow the bridge. The dorsal septum was lowered 1 mm at the rhinion to correct the slight convexity. This procedure proved insufficient to create an open roof to facilitate osteotomies and narrowing of the nasal bridge. Wedges of bone, 3 mm wide at their base, were removed on either side of the bony septum, while maintaining the septal height. Rectangular-shaped segments of cartilage of similar width were removed from the entire length of the upper lateral cartilages on either side of the cartilaginous septum. Transverse and lateral osteotomies were performed to facilitate medial displacement of the nasal sidewalls. The 3-year postoperative results are shown in Figure 6. The nasal bridge has been narrowed, a high dorsal line has been maintained, and the convexity has been corrected.

CASE 2

A 29-year-old woman presented with a broad osseocartilaginous nasal vault and slight underprojection of the dorsal line. The surgical goal was to narrow the bony and cartilaginous vaults and augment the projection of the entire dorsal line. Although only grafts used to increase dorsal height have the effect of narrowing the nasal bridge, the limited degree of augmentation necessary to provide an ideal dorsal line in this patient would not have been adequate to narrow the osseocartilaginous vault. For this reason, bilateral paramedian segments, 2 mm wide and consisting of portions of a thick cartilaginous septum and the upper lateral cartilages, were removed from the roof of the middle vault. Also, bilateral paramedian wedges of nasal bone, 2 mm wide at their bases, were removed from the bony vault. The height of
the bony and cartilaginous septum was not altered. Transverse and lateral osteotomies were performed. The bony and cartilaginous dorsum was augmented with a 2-mm-thick septal cartilage onlay graft. The 2-year postoperative results are shown in Figure 7. Augmentation of the dorsal line was accomplished along with narrowing of the bony and cartilaginous vaults. The deformed medial crura of the lower lateral cartilages were corrected by excision and reanastomosis of the remaining segments.

CASE 3

A 33-year-old woman presented with an excessively broad osseocartilaginous vault and slight convexity of the dorsal line at the rhinion. The wide nasal dorsum was most marked in the cartilaginous vault. The surgical goal was to narrow the bony and cartilaginous vaults and create an ideal dorsal profile line. Bilateral paramedian segments of cartilage, 2 mm wide, were removed at the medial border of the upper lateral cartilages, while maintaining the height of the cartilaginous septum. The upper lateral cartilages were reattached to the septum in a more medial position. The convexity of the rhinion was resected (2-mm reduction). A 1-mm piece of crushed cartilage approximately 1.5 cm in length was used as a radix graft and positioned at the nasofrontal angle. Transverse and low-to-low lateral osteotomies were performed, and the nasal bones were infrafractured. The 1-year postoperative results are shown in Figure 8. The osseocartilaginous vault has been narrowed and the dorsal profile has been improved by a combination of minimal augmentation and reduction.

CASE 4

A 23-year-old woman presented with a cleft lip nasal deformity and nasal obstruction. Her entire dorsum was wide. The nasal tip was also wide and asymmetrical. The bony vault was underprojected except at the rhinion. The cartilaginous vault was slightly overprojected with a convex contour. The goal was to concomitantly narrow the bony vault and augment it with a radix graft. The carti-
laginous vault required minimal reduction of projection, but considerable narrowing. The projection of the
dorsum at the rhinion was reduced 1.5 mm. This
maneuver did not create an open roof of the bony or carti-
laginous vault. On either side of the septum, paramed-
dian bone wedges, 2 mm wide at their bases, were removed
from the bony vault, while maintaining the height of the
bony septum except at the level of the rhinion. Bilateral
2-mm-wide rectangular-shaped segments of cartilage were
removed along the length of the upper lateral cartilages
adjacent to the septum. Transverse and low-to-low lat-
eral osteotomies were completed, and the sidewalls of the
bony vault were infractured. A 2-mm-thick cartilagi-
nous radix graft was used to augment the cephalic por-
tion of the bony dorsum. The asymmetry of the tip was
corrected with a composite auricular cartilage graft that
was used to replace the left lateral crus of the lower lat-
eral cartilage. A septal cartilage shield-shaped graft was
placed caudal to the lower lateral cartilages to improve
tip contour. The early postoperative views are shown in
Figure 9. The osseocartilaginous vault has been nar-
wored and the dorsal profile has been improved by a com-
bination of minimal augmentation and reduction.

**COMMENT**

Four questions must be answered when determining how
best to narrow the broad nose: (1) Are both the bony and
cartilaginous vaults involved? (2) What are the anatomical
origins of the wide dorsum? (3) Should the projection
of the dorsal line remain unchanged or does it re-
quire augmentation, reduction, or a combination of both?
(4) Does contour of the dorsal line require modification?
Depending on dorsal height, augmentation, reduction,
or a combination of the two may be required in ad-
tion to narrowing the bridge. In other circumstances,
the projection of the dorsal line should remain unchanged and only the width of the nose altered. Patients with wide nasal bridges and an ideal projection of the dorsum present the greatest technical challenge to the rhinoplasty surgeon.

The approach used to narrow the nasal bridge is dependent on the anatomical cause of the excess width. Figure 1 shows an algorithm that is helpful in managing the broad nasal bridge. The options outlined by the algorithm are used in cases in which reduction of dorsal height would create an unfavorable result; therefore, another alternative for creating an open roof and subsequent medialization of the nasal sidewalls must be adopted. When a broad bony vault is due to thickened or overdeveloped midline structures, bone must be excised to facilitate medialization of the sidewalls after the osteotomies are performed. In some instances, this procedure may require paramedian wedge excisions of the nasal bones. In other cases, it may require fracture dislocation, removal, or thinning of the bony septum beneath the nasal bones. Thick bony nasal sidewalls may be narrowed by drill contouring or osteotomy, depending on the overall thickness of the bone.

When a broad cartilaginous nasal vault is due to a thickened septum, it can be narrowed by shave excisions on either side. Rectangular-shaped segments of the medial borders of the upper lateral cartilages are removed when excessive width is the result of horizontal orientation of the cartilages. In other instances, to improve the contour of the transition between dorsum and sidewall, strips of cartilage representing the “shoulders” of the upper lateral cartilages are removed. For floppy
upper lateral cartilages with a convex configuration, horizontal mattress suture contouring may suffice to narrow the bridge. Techniques used to narrow the bony and cartilaginous vaults may be combined when both components of the nasal bridge display excessive width, which is the most frequent finding.

Accepted for publication May 27, 2003.

This study was presented at the Fall Meeting of the American Academy of Facial Plastic and Reconstructive Surgery; September 6, 2001; Denver, Colo.

Corresponding author and reprints: Shan R. Baker, MD, Division of Facial Plastic and Reconstructive Surgery, Department of Otolaryngology–Head and Neck Surgery, Center for Facial Cosmetic Surgery, University of Michigan, 19900 Haggerty Rd, Suite 103, Livonia, MI 48152 (e-mail: shanb@umich.edu).

REFERENCES