New Techniques for Management of the Crooked Nose

Allison T. Pontius, MD; Joseph L. Leach, Jr, MD

The crooked or twisted nose results from a complex deformity of the bony pyramid, the upper and lower cartilaginous vaults, and the septum and causes functional and aesthetic problems. The forces of scar contracture coupled with long-standing cartilage deformation may make the crooked nose resistant to conventional surgical intervention. The middle vault of the nose may exhibit deformities that are due to atrophy, deviations, and skewing in relationship to the other regions of the nose. We report a series of 79 cases of significantly crooked noses to highlight 5 techniques not widely discussed in the facial plastic surgery literature. 

Precise analysis of the crooked nose is the first step in determining optimal management strategies. However, prior to addressing the nose, facial asymmetries must be elucidated and considered. To analyze the face, a vertical line is drawn from the exact midpoint between the medial canthi, and a horizontal line is drawn that passes through both medial canthi. From these 2 reference lines, facial asymmetries become obvious. In a review of 125 patients with crooked noses by Vuyk,6 broad categories of facial asymmetries were found: (1) difference in facial width; (2) difference of orbital level; (3) rotation of the pyriform aperture; (4) lateral placement of the pyriform aperture; (5) non-horizontal alar base; and (6) maxillary flattening and slanting of the midface to one side. It is critical to analyze the face in concert with the nose and to discuss underlying facial asymmetries with the patient prior to operative intervention.

Once this is accomplished, it is useful to divide the nose into horizontal thirds for purpose of analysis. The upper third comprises the bony vault, which consists of the paired nasal bones and the ascending frontal processes of the maxillae. The middle and lower thirds are primarily cartilaginous and are composed of the upper and lower lateral cartilages.

Nasal analysis begins with noting the deviation of the nose from the midline of the face. Beginning with the upper third of the nose, the width of the bony pyramid is assessed as are the length of the nasal bones. The length of each nasal bone should be assessed individually because asymmetric nasal bones will require asymmetric hump reduction to prevent foreshortening of the more vertically oriented nasal bone on the side of the convexity.2 While bony asymmetry is an important cause of deviation, it is usually well addressed with osteotomies and reduction, and it is not discussed in this article.

Analysis continues with evaluation of symmetry of the middle third of the nose. One attempts to determine the relationship of the upper lateral cartilage with the nasal bones, particularly if there is any narrowing, step-off deformity, or skewing. Scarring or warping in the middle vault is also assessed. The lower third of the nose includes the medial, middle, and lateral crura of the lower lateral cartilages. Asymmetry from septal deformity in this area is appreciated by skewing of the tip-defining points from the horizontal. The caudal edge of the septum may be apparent because it protrudes into one nostril or the other. The lower lateral cartilages may have intrin-
sic deformities that lead to asymmetry, but treatment of these is beyond the scope of this article.

Internally, the septum is analyzed for deviations, particularly those deflections that are high dorsal or caudal. Of high importance in this region is the area of the internal nasal valve, which is formed by the caudal free edge of the upper lateral cartilage, the septum, and the nasal floor. Any angle at less than 10° may result in nasal airway obstruction.

A history of trauma is particularly pertinent and if present whether it occurred early or later in life. Even minor trauma in early life can lead to marked deformation with continued chondrocyte growth. Frequently, patients with relatively recent trauma can be treated with closed reduction or osteotomies/hump removal/septoplasty using an endonasal approach. Others, who have long-standing bony vault deviation without a twisting component, are also adequately treated endonasally.

The methods we discuss herein are best suited for patients with warping, deformity, and malposition of the septal and upper lateral cartilages, particularly in relationship to the nasal bones and lower lateral cartilages. Five specific abnormalities are addressed: (1) collapse of the upper lateral cartilage in relationship to the nasal bone/pyriform aperture; (2) deformity or resorption of the upper lateral cartilage in relationship to a straight dorsal cartilaginous septum; (3) a dorsal septum that is skewed in relationship to the nasal bones; (4) buckling of the septal cartilage at the critical intersection of the dorsal and caudal septal struts; and (5) buckling of the caudal septal cartilage.

**TECHNIQUE**

We begin with an open rhinoplasty approach to fully visualize the nasal skeleton. The lower lateral cartilages are separated one from another at the interdomal ligament. The upper lateral cartilages are detached from the septum, while intranasal mucosal integrity is preserved. The septum is exposed dorsally, and the deviated portion is excised leaving a 10-mm dorsal and caudal strut. If there is caudal septal deflection, it is repositioned in the midline via either a suture to the nasal spine or with a “swinging-door” flap and suture fixation. Dorsal hump reduction is performed followed by medial and lateral osteotomies. At this point, we use 1 or a combination of the following techniques, depending on the abnormality found:

The *sidewall-spreading suture* (Figure 1) is used on the side with a depressed or concave upper lateral cartilage. It consists of a horizontal mattress suture of 4-0 polydioxanone extending from the periosteum of the nasal bone to the upper lateral cartilage. As the suture is tightened, it causes the upper lateral cartilage to flare laterally and places the nasal bone and upper lateral cartilage in proper alignment.

The *triangular spreader graft* (Figure 2) is especially useful after the sidewall-spreading suture has been placed on an atrophic upper lateral cartilage creating a gap between the upper lateral cartilage and the septum. It is carved in a triangular shape from harvested cartilage and secured in the space between the septum and upper lateral cartilage with 4-0 polydioxanone sutures.

Clocking sutures (Figure 3) bring the lower third of the nose into alignment with the upper 2 thirds. The dorsal septal cartilage is first scored vertically. Clocking sutures of 4-0 polydioxanone are placed caudocephalically on the convex side and cephalocaudally on the concave side between the septum and upper lateral cartilages. These sutures unfurl the dorsal septum and secure it in the midline.
lages. When the sutures are tightened, they unfurl the dorsal septum and secure it in the midline.

**Septocolumellar sutures** (Figure 4) are used in cases where residual caudal septal bowing remains. The caudal septum is scored on the concave side and is secured to an extended columellar strut. The caudal septum is fixed to the strut with multiple simple sutures of 4-0 polydioxanone.

**Excision of a “Burow triangle” of cartilage** (Figure 5) can be used when the residual caudal and dorsal struts of septal cartilage are straight except for residual bowing in the “elbow” area. For this technique, the caudal and dorsal struts are sharply divided, and the overlapping triangle of cartilage is excised. The caudal and dorsal struts are then reapproximated with 4-0 polydioxanone sutures, and the bowing is eliminated.

## RESULTS

From 1993 to 2003, 79 patients in the private practice of 1 of us (J.L.L.) underwent corrective surgery for twisted-nose deformity using 1 or more of the 5 techniques discussed. There were 48 male patients and 31 female patients. Sixteen of these cases were revision septorhinoplasties. All patients had deformities of the middle vault of the nose. The 5 techniques were used a total of 178 times, with each patient averaging 2.25 techniques per operation. Patients frequently underwent hump reduction, osteotomies, septoplasty, and/or tip work in addition to the techniques discussed. The septocolumellar technique was used the most (66 times); followed by the triangular spreader graft (50 times); the sidewall-spreading suture and the Burow triangle technique (22 times each); and clocking sutures (19 times). Follow-up ranged from 1.5 months to 10 years, with an average follow-up of 13.1 months. Follow-up was con-
ducted in the office and included history and physical examination. Although all patients noted improvement, 7 patients had noticeable persistent deviation after surgery on anterior view. Three of these elected to have revision surgery, which corrected their asymmetry. Representative patients are shown in Figure 6 and Figure 7.

The main schools of thought regarding management of the crooked nose are (1) camouflage techniques, (2) complete deconstruction and anatomic reconstruction of the nose, and (3) a combination of techniques. Proponents of the camouflage technique hold the goals of surgery on the crooked nose to be creation of a functional nose that appears straight. Support of the nose should never be compromised for obtaining a nose that simply appears straight. However, others propose that true correction of the deformity requires release of all extrinsic deforming forces on the nose as well as correction of all intrinsic deforming factors. Extrinsic forces are those forces acting on the deviated nasal pyramid, such as the forces acting through the attachments of the upper and lower lateral cartilages and forces from deviation or injury to the vomer, the perpendicular plate of the ethmoid, or the maxillary crest. Intrinsic deforming forces are due to growth and development of the cartilage or injury of the cartilage. To correct the deformity, the extrinsic forces must be released, and the intrinsic forces must be overcome by weakening the cartilage or overpowering the deforming forces with sutures or grafts.

Additionally, others support using more aggressive forms of tissue modification as well as camouflage techniques while maintaining support and function of the nose. Indeed, in our cases that required revision, we learned that “more is better” in that adding 1 or more of the additional techniques (particularly clocking sutures) resolved the asymmetries. We advocate thoroughly deconstructing the deformed nose and then reconstructing a truly straight nose that is well supported.

In summary, the approach to the patient with a crooked nose should follow a methodical analysis and complete treatment of each deforming factor while support of the nasal skeleton is maintained. The 5 techniques we have presented have proven useful in the management of this challenging problem.

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Correspondence: Joseph L. Leach, Jr, MD, Department of Otolaryngology–Head and Neck Surgery, The University of Texas Southwestern Medical Center at Dallas, 5323 Harry Hines Blvd, Dallas, TX (joseph.leach@utsouthwestern.edu).

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