

The Crooked Nose: A Practical Guide to Successful Management

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Learning Objectives: After studying this article, the participant should be able to: (1) Preoperatively evaluate the patient with a crooked nose. (2) Develop a comprehensive preoperative plan specific to the patient. (3) Effectively “deconstruct” and rebuild the crooked nose to address both aesthetic and functional concerns. (4) Use postoperative techniques to maximize outcomes.

Summary: Correction of the crooked nose requires a detailed understanding of the relevant surgical anatomy, identification of the deforming forces—both intrinsic and extrinsic—contributing to the deformity, and knowledge of techniques needed to effect the desired change. This continuing medical education article takes the reader through the evaluation and formulation processes to develop a patient-specific plan and provides surgical pearls necessary to get the best results possible. Most importantly, this article emphasizes the need to treat the crooked nose as a reconstructive rather than routine aesthetic operation. (*Plast. Reconstr. Surg.* 149: 779e, 2022.)

The crooked nose, also described as the deviated or twisted nose, is a challenging problem to treat for even the most experienced surgeons. The crooked nose results from deforming forces that act on the structural components of the nose (i.e., bony and cartilaginous), and are described as those extrinsic and intrinsic to the septum.^{1,2} Extrinsic forces include attachments to the upper lateral cartilage, attachments to the lower lateral cartilage, vomer deviation, scar contraction, and the skin and nasal bones. Intrinsic forces include septal fracture and injury to the quadrangular cartilage as a result of deforming forces (i.e., during pregnancy, parturition, or early trauma) attached to the vomer and the perpendicular plate of the ethmoid.³ Any combination of these forces will result in an unbalanced force on the septum, resulting in septal malposition, which in turn results in a crooked nose.¹ These deforming forces must be aggressively released by means of an open rhinoplasty approach. The nose must then be rebuilt in a systematic fashion. Less aggressive maneuvers will not result in satisfactory and long-term correction. Without release of all extrinsic and intrinsic deforming forces, no amount of rebuilding will successfully

straighten the nose. The crooked nose is a “big problem,” and as such requires a “big operation.” Importantly, treating the crooked nose should be considered a reconstructive septorhinoplasty, rather than a routine aesthetic procedure.

EVALUATION

The goal of the patient evaluation is to determine the specific anatomical areas of concern, such that a problem-based surgical plan can be formulated. However, identifying facial asymmetry of the nasal region is critical.⁴ The aesthetic and functional examination of the nose has been well documented in other publications.^{1,2,5,6} The surgical plan is organized in a problem-based fashion. One column lists the problems noted on the physical examination where the anatomical areas of concern are enumerated in a systematic fashion and organized in rows according to the view (i.e., anteroposterior, lateral, basal) with the corresponding surgical maneuvers necessary to effect the desired change. Following this,

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a step-by-step guide may be created, detailing all surgical maneuvers planned in order. Goals of surgery, which incorporate the patient's concerns, are included. This operative plan is posted in the operating room along with photographs of the patient for intraoperative reference. (See **Document, Supplemental Digital Content 1**, which displays the operative planning sheet. After the initial consultation, the operative planning sheet is completed. This is used as an operative guide in the operating room on the day of surgery, <http://links.lww.com/PRS/E989>.)

SURGICAL TREATMENT: PART I. RELEASE OF THE NOSE

Surgical Setup and Markings

A smooth operation begins with a thoughtful setup. First, the patient is orally intubated (typically with an oral right-angle endotracheal tube) and secured in the midline, either to the mandibular teeth or taped to the lower lip and chin. Care must be taken with securing the endotracheal tube to avoid distorting the soft tissues of the upper lip and nose. The eyes are protected with lubricant and taped with sterile Steri-Strips (3M, St. Paul, Minn.) following the surgical preparation. The patient is rotated such that the surgical team has complete access to the head and chest. A nasal speculum examination is again performed, confirming the operative plan. Long-acting local anesthetic containing epinephrine is injected into the nasal skin, columella, septum, and inferior turbinates for additional vasoconstriction

and analgesia. Infraorbital and supraorbital and trochlear nerve blocks are also performed at this time with long-lasting local anesthetic. Vibrissae are trimmed as needed. Oxymetazoline-soaked cottonoids are then placed along the septum on each side. The skin of the head, neck, and chest is then widely prepared and draped out, in such a way as to provide exposure for a complete assessment of the face. During the presurgical time-out, the surgical team communicates with the anesthesia team the possibility of permissive hypotension, particularly during and after the complete osteotomies to limit blood loss.

Before starting the operation, reference landmarks are marked, including the forehead midline, medial brow, midline radix, nadir of Cupid's bow, maxillary dental midline, and central chin. The dorsal septum, lower lateral cartilages, and nasal bones are outlined to assess the degree of dysmorphology and aid in the surgical plan (Fig. 1). For the majority of cases, an open approach is required for complete correction of the significantly deviated nose and to allow for aggressive release of all deforming forces and mobilization of all involved structures.^{2,7-9}

Exposure

A transcolumellar skin incision is made at the narrowest part of the columella, which is typically placed at the junction of the anterior one-third and posterior two-thirds of the columella. The incision is then carried cephalically into a vestibular infracartilaginous incision at the junction of the vibrissae. Care should be taken, however, during



Fig. 1. Intraoperative anatomical assessment. The surgeon should aim to visualize the surgical anatomy with the goal of formulating the operative plan. (Left) A significantly deviated septum (asterisk), displaced lower lateral cartilage (LLC), and nasal bones are outlined preoperatively. (Center and right) Asymmetry of nasal bone length is identified preoperatively as indicated by the measurements (in millimeters). Such asymmetries must be taken into consideration when planning nasal osteotomies.

incision, as the vibrissae-bearing area can overlap the lateral crus.¹⁰ The lower lateral cartilages, attached to the nasal mucosa, are identified and dissected. Extrinsic deforming forces are released sequentially. In secondary or cleft rhinoplasties, scar is judiciously removed from the skin envelope, which will prove critical for ultimate skin redraping. This is done conservatively to prevent injury to the subdermal plexus of the nasal skin.

Cartilage Dissection and Release

The lower lateral cartilages are then separated from the upper lateral cartilages at the scroll area along the cephalic edge of the lower lateral cartilage. Frequently, instead of discarding a cephalic trim, a lower lateral cartilage autoaugmentation is performed with the cephalic portion of the lower lateral cartilage, augmenting the inferior 7 to 8 mm of native lower lateral cartilage. The autoaugmentation is performed by measuring out the inferior 7 to 8 mm of lower lateral cartilage cartilage, and scoring instead of trimming, folding the cephalic portion onto the inferior portion. This is secured with 4-0 clear polydioxanone suture. Autoaugmentation reinforces the structural integrity of the lower lateral cartilage, which is often needed to reshape the soft tissues.

Next, the upper lateral cartilage are separated from the quadrangular cartilage. The septal angle is identified and an elevator is then used to dissect the septal quadrangular cartilage in a subperichondrial plane. This dissection is continued to the vomer and perpendicular plate of the ethmoid in the subperiosteal plane. Although a complete dissection of the quadrangular cartilage is ultimately required, there are three important areas that require special attention: (1) the keystone area, (2) the internal nasal valve, and (3) the convexities of the damaged quadrangular cartilage. First, the keystone area is the confluence of the nasal bones, the perpendicular plate of the ethmoid, and the quadrangular cartilage. Although much of the quadrangular cartilage, vomer, and perpendicular plate of the ethmoid will be harvested for grafts or removed because of obstruction, maintenance of the keystone area integrity, and the superior junction of the quadrangular cartilage and perpendicular plate of the ethmoid, is a must to ensure that the remaining dorsal-caudal quadrangular cartilage L-strut has stability. Second, the mucosa of the internal nasal valve should not be violated during the initial dissection. The septal dissection is carried cranially, and the internal nasal valve mucosa is dissected off the quadrangular cartilage and upper lateral

cartilages. This dissection is continued to the undersurface of the nasal bones to allow a safe dorsal hump reduction, complete osteotomies, and a protected space to place extended spreader grafts. Following the complete dissection of the internal nasal valve mucosa, the upper lateral cartilages are safely released from the dorsal quadrangular cartilage. If the upper lateral cartilages are exerting significant extrinsic deviating forces on the septum, this maneuver can significantly straighten the septum.¹ Should a dorsal hump reduction be performed, consideration is given to not excising excess dorsal upper lateral cartilage, but rather performing an autoaugmentation of the upper lateral cartilages (or autospreader flaps). Third, the quadrangular cartilage is now completely dissected subperichondrially. At this time, particular attention is given to the severe acute angle convexities of the quadrangular cartilage that often accompany the crooked nose. Dissection begins with the concavities of the quadrangular cartilage first, followed by quadrangular cartilage release from the vomer and inferior perpendicular plate of the ethmoid. Once this is completed, an acutely curved elevator can subperiosteally dissect the opposite (convex) side of the vomer. The vomer is then removed with a rongeur, and this will facilitate the dissection of the quadrangular cartilage convexities. When severe quadrangular cartilage convexities are approached in this fashion, mucosal tears can be minimized.

Dorsal Hump Reduction

Dorsal bony hump reduction can be completed using a rasp if only a slight reduction is required. If over 1 mm of reduction is necessary, a reciprocating rasp is much more efficient.⁶ Following bony hump reduction, any necessary dorsal quadrangular cartilage hump reduction must be completed before septoplasty to ensure that a 1-cm quadrangular cartilage L-strut is preserved. Reduction of the dorsal quadrangular cartilage is performed with scissors or knife blade under direct vision. As described above, instead of reducing the dorsal aspects of the upper lateral cartilage, an autoaugmentation is performed. Some surgeons prefer to perform dorsal hump reduction at the very beginning of the operation and before separation of the upper lateral cartilage from the dorsal quadrangular cartilage; however, the upper lateral cartilages can obstruct the true evaluation and performance of the dorsal hump reduction. In addition, taking down the dorsum before completely dissecting the internal nasal valve mucosa free can result in injury,

complicating future steps such as spreader graft insertion. Most importantly, the keystone area, and superior connection of the quadrangular cartilage and perpendicular plate of the ethmoid, must be preserved to maintain structural integrity.

Septoplasty

The septoplasty is one of the most powerful maneuvers in treating the crooked nose and improving nasal airflow, as a significant septal deformity is nearly always a contributing factor in the crooked nose.² While respecting the keystone area, the perpendicular plate of the ethmoid, the quadrangular cartilage, and the vomer should be completely dissected in the subperichondrial/subperiosteal plane. Obstructing and off-midline portions of all three components of the septum must be removed. When removing obstructive portions of the perpendicular plate of the ethmoid, care must be taken to not propagate fractures superiorly resulting in injury to the skull base. At this point, any obstructive portions of the quadrangular cartilage, or what is needed for grafts (extended spreader and columellar strut), are removed under direct vision, maintaining a 1-cm dorsal-caudal quadrangular cartilage L-strut.

Inferior Turbinectomy

A crooked septum, over time, frequently results in overgrowth of the inferior turbinate corresponding, and adjacent to, septal concavities. In addition, complex deformities of the quadrangular cartilage frequently result in bilateral concavities and inferior turbinate overgrowth. A long, straight clamp may be placed along the full length of the inferior turbinate and used to crush it. Following this, an endoscopic LigaSure (Medtronic, Minneapolis, Minn.) is the ideal instrument for performing the turbinectomy, as it allows for excision with simultaneous cautery hemostasis. The endoscopic LigaSure is applied to the crushed portion of the inferior turbinate, beginning anteriorly, and moving posteriorly in a sequential fashion. Frequently, in the longstanding significantly crooked nose/septum, bilateral partial inferior turbinectomies are required, so that when the septum is repositioned in the midline, obstruction from overgrown inferior turbinates does not occur.

Osteotomies

Complete nasal bone osteotomies are the most powerful tool for straightening the upper and middle thirds of the nose and narrowing the nasal base. However, complete osteotomies,

rather than greensticked perforations, are often required in the crooked nose to evoke a significant correction. If the resulting nasal bony pyramid is not freely mobile, complete straightening of the crooked nose will not be accomplished. There are, however, circumstances in which a percutaneous approach is appropriate (e.g., unilaterally affected nasal bones where bony movement of the unaffected side is minimal). Bilateral low-to-low (pyriform rim to medial canthus) and medial-lateral (keystone to medial canthus) osteotomies are designed and drawn out on the skin to achieve precise execution (Fig. 2). The low-to-low osteotomies are designed from the pyriform rim to just medial to the anterior lacrimal crest. The medial-to-lateral osteotomies are designed from the keystone region to the medial canthus connecting with the superior aspect of the low-to-low osteotomies.² When exposure is limited, a percutaneous approach to the medial-to-lateral osteotomy can be performed.

Exposure to the low-to-low osteotomy is achieved with a small incision within the nasal vestibule at the pyriform rim. A narrow subperiosteal tunnel is created beneath the outlined low-to-low osteotomy. A single guarded curved osteotome is engaged along the inferior portion of the marked low-to-low osteotomy at the pyriform rim, with the guard facing laterally to permit palpation of the osteotome and guide the trajectory of the osteotomy. The osteotomy is continued toward the medial canthus just medial to the anterior lacrimal crest. Frequently, there is an audible change in the sound of the osteotome at this point. Next, the medial (medial-to-lateral) osteotomy is performed under direct visualization. A 2- to 5-mm osteotome is placed just superior and lateral to the keystone region and is carried to the superior extent of the low-to-low osteotomy near the medial canthus. [See [Video \(online\)](#), which displays the author's preferred technique to perform a lateral (low-to-low) and medial (medial-to-lateral) osteotomy by means of an endonasal and direct approach, respectively.] Confirmation that the nasal bones are completely mobilized is confirmed. It is again critical to maintain the integrity of the keystone region while completing these maneuvers and to preserve the mucosal lining of the internal nasal valve and its superior extent beneath the nasal bones. If the keystone area is disrupted, and the quadrangular cartilage dorsal L-strut becomes detached, it must be resuspended from the nasal bones or radix by means of bone tunnel sutures.^{11,12} In the excessively wide nose, stacked or double osteotomies may be required



Fig. 2. Nasal osteotomies. (Left) Design of lateral (low-to-low) (a, dotted line) and medial osteotomies (b, dotted and solid lines). Low-to-low osteotomies begin low along the piriform rim and extend toward the medial canthus; medial osteotomies extend from the midline along the nasal bones and continue toward the medial canthus. (Right) Double or stacked lateral osteotomies (a and c) in addition to medial osteotomies (b) can be performed for the excessively wide and/or deviated nose. Of note, when performing double lateral osteotomies, the more medial of the two should be performed first.

to adequately narrow the nose (Fig. 2).¹³ Of note, in addition to permissive hypotension, tumescent local anesthesia can be infiltrated during and after osteotomy completion to limit blood loss.

SURGICAL TREATMENT: PART II. REBUILDING THE NOSE

Cartilage Grafts

After complete release of all deforming forces, including osteotomies, the nose must be rebuilt with straight, rigid cartilage grafts. Cartilage scoring and suturing techniques, such as the Mustardé suture, can be useful adjuncts, but are not on their own sufficient to completely correct the crooked nose. Rib cartilage provides straight and rigid cartilage to create the necessary grafts for reconstruction with a strong foundation.¹⁴ At a minimum, the crooked nose frequently requires bilateral extended spreader and columellar strut grafts.¹⁴ In cases where control of tip rotation is a focus, septal extension grafts should be used.¹⁵

Autologous cartilage is the best source for grafting and is most easily carved from the quadrangular cartilage after septoplasty.⁵ However, the amount of graft cartilage required may exceed the

cartilage available from the septum, particularly when there is quadrangular cartilage deformity. In addition, if the patient has undergone prior septoplasty, there may be no septal cartilage available for use. Rib cartilage is an abundant supply of straight and rigid cartilage with multiple sites of harvest available. Its harvest is uncomplicated and has been described in detail.¹⁶ Conchal cartilage is another potential source of cartilage but should not be used for structural support, as it is curved and far more elastic than septal or rib cartilage. Conchal cartilage is typically reserved for crushed onlay grafts such as tip grafts or alar batten/margin grafts. Cadaveric costal cartilage remains a viable alternative to autologous cartilage, and long-term studies support its use.¹⁷⁻¹⁹ Although outcomes with cadaveric cartilage have been favorable in the senior author's experience, the decision to use autologous or homologous cartilage grafts is left to the patient and family.

It is the senior author's preference to avoid extracorporeal L-strut reconstruction. Even in cases with severely deviated cephalic septum, a straight cartilaginous dorsum can be achieved without removal of the L-strut. The caudal septum should be secured to the anterior nasal spine or to

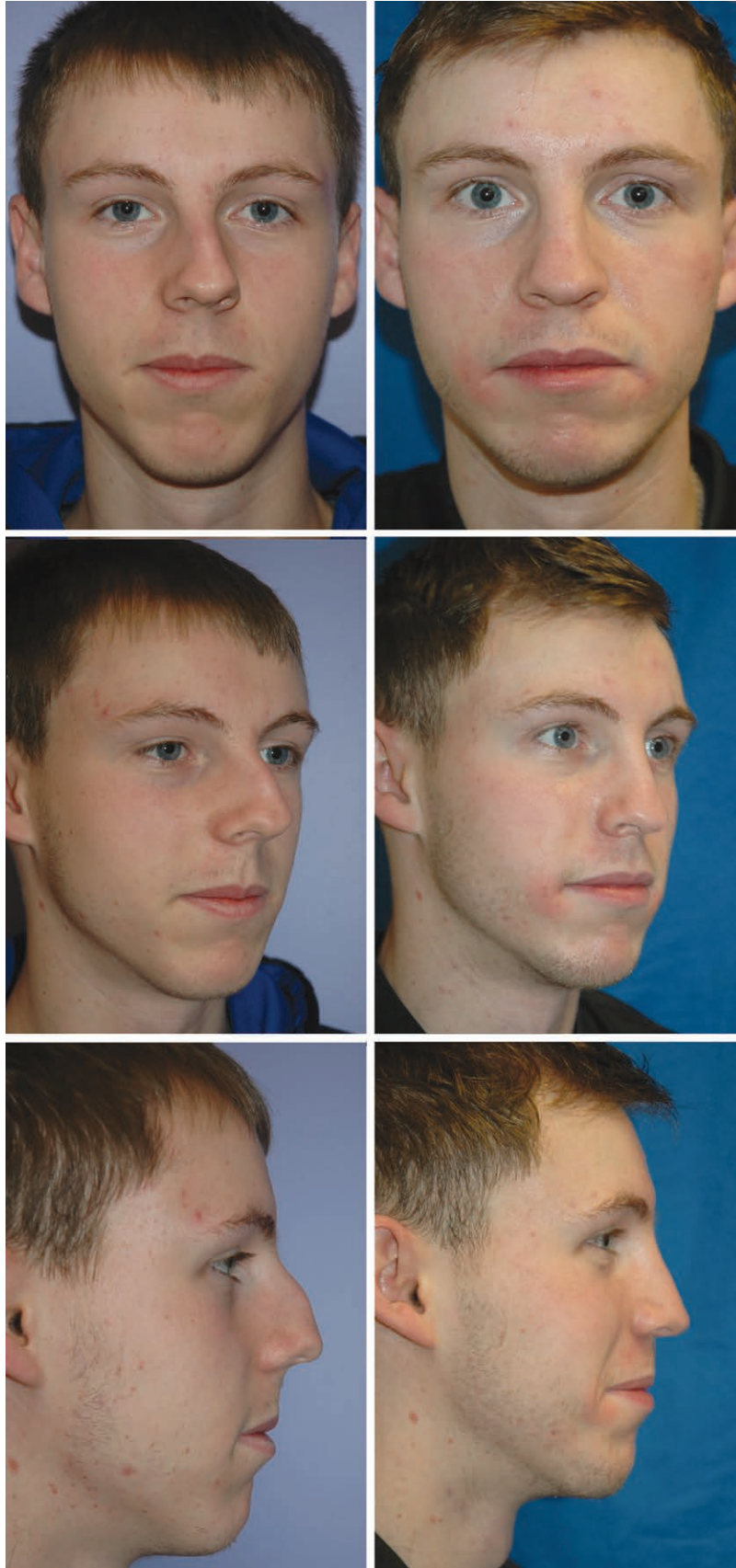


Fig. 3. (Continued).

the true facial midline, if the anterior nasal spine has grown asymmetrically and has needed to be removed. Frequently, the caudal septum overgrows into one of the anterior nasal airways and must be trimmed to provide a straight midline strut that can be secured to the septum. Next, the previously carved extended spreader grafts are sutured to the dorsal septum.¹⁴ These extended spreader grafts widen the internal nasal valve, reinforce the straightening of the dorsal septum, straighten and widen the dorsal nasal aesthetic lines, and assist with tip definition and projection. The autoaugmented upper lateral cartilages are then suture suspended to the extended spreader grafts and dorsal quadrangular cartilage L-strut. The columellar strut graft is next sutured to the facial midline and caudal septum. The columellar strut is then secured to the extended spreader grafts, either sandwiched between them, or sewn to one that extends to meet it. This results in a rigid dorsal-caudal A-frame, driving the tip back to the facial midline to straighten and project the tip.¹⁴ Care is taken when fashioning the columellar strut and securing it to the extended spreader grafts to control tip rotation, columellar-labial angle, and columellar-tip angle.

Additional reconstructive nasal grafts may be required and depend on the individual needs of the crooked nose. For those longstanding crooked noses with soft-tissue asymmetry, the lateral crural graft can then be designed and sutured deep to the lateral crura to enhance the strength, projection, and support of external nasal valve.¹⁴ Intradomal and interdomal sutures bring the medial crura of the lower lateral cartilage together to medialize and narrow the tip and can be used to normalize the projection and angle of the crura.²⁰ Tip grafts are then sutured to the tip to enhance projection, definition, and the supratip break point. Dorsal onlay grafts can be fashioned from a single piece of cartilage, crushed cartilage, or made with a sandwich technique between fascia or ultrathin

acellular dermal matrix and used to raise the dorsum and straighten the dorsal nasal aesthetic lines.¹⁴ Alar margin grafts can be used to correct a notched and slumped alar margin. A pocket can be dissected at the alar margin and a small, straight graft is placed along the margin.

Soft-Tissue Adjustments

Longstanding crooked noses can be essentially “tissue expanded,” with resulting nostril and alar base asymmetry. At this time, the ala, alar base, alar facial groove, alar lip groove, and nostril sill can be marked. Each nostril aperture can be measured and the difference calculated. These may sometimes be addressed with a Weir excision and result in soft-tissue symmetry following the correction of the underlying cartilage and bony framework.

Closure

Skin redraping and soft-tissue closure is a critical component of the successful treatment of the crooked nose, as this allows the underlying rebuilt structure to show through without distortion. The columella is first precisely realigned and closed using buried 6-0 absorbable monofilament suture. If desired, external skin sutures can also be placed. The vestibular incision is then meticulously closed. Soft-tissue closure requires constant monitoring for symmetry, soft triangle notching, and overall shape of the external valve. Soft-tissue closure can intentionally change the external shape of the nose (i.e., hooding of soft triangle) by means of asymmetric nasal lining trimming while closing the internal incisions. Conversely, closure can unintentionally change the shape of the nose in an undesirable way if not carefully monitored. Finally, internal Doyle splints (Doyle Medical Devices; Doylesurgical.com) are placed and sutured through the caudal septum. Large nasal conformers, used at the time of primary cleft-lip and nose repair, may also be placed to aid the molding of asymmetric nares in the postoperative period. Steri-Strips are applied, followed by an external thermoplastic splint (WFR/Aquaplast Corp., Avondale, Pa.). The splint is molded to maintain the desired medialization and narrowing of the nasal bones.

POSTOPERATIVE MANAGEMENT

Preoperative and postoperative results are shown in **Figures 3** and **4**. [See **Figure, Supplemental Digital Content 2**, which displays preoperative and postoperative results. (*Left*) A

Fig. 3. (Continued). Preoperative and postoperative photographs following reconstructive septorhinoplasty. (*Left*) An 18-year-old male patient with a “crooked” nose who presented with functional and aesthetic concerns. Note the deviated dorsum and tip on frontal and oblique views, significant dorsal hump on lateral view, and deviated and boxy tip. (*Right*) Fourteen-month postoperative follow-up after septorhinoplasty demonstrates significant improvement in nasal shape. Key components of the operation included nasal osteotomies, including lateral (low-to-low) and medial, bilateral spreader graft placement; columellar strut graft placement; and submucous septal resection and inferior turbinectomy.



Fig. 4. (Continued).

20-year-old woman with significant nasal tip and dorsal deviation. On basal view, the tip is deviated and caudal septum is dislocated and lateralized to the patient's left with associated nasal airway obstruction. (*Right*) Postoperative follow-up at 5 months demonstrates a midline nasal tip and dorsum. Basal view demonstrates relocation of the caudal septum and alleviation of nasal airway obstruction. On lateral view, slight overprojection of the nasal tip is appreciated, <http://links.lww.com/PRS/E990>. See **Figure, Supplemental Digital Content 3**, which displays preoperative and postoperative results. (*Left*) A 17-year-old girl with significant nasal tip and dorsal deviation. (*Right*) Postoperative follow-up at 4 months demonstrates improved tip symmetry and position with a slight persistent dorsal deviation. On lateral view, preservation of the patient's projection and rotation is appreciated, <http://links.lww.com/PRS/E991>.]

Internal nasal splints are removed by 5 to 7 days postoperatively. Alternatively, bioresorbable nasal packing (i.e., NasoPore; Stryker, Kalamazoo, Mich.) can be used, obviating the need for removal. The external nasal splint and taping is removed at 2 weeks postoperatively. Similarly, any transcolumellar sutures are removed at this time and replaced with thin surgical wound tape to mitigate scarring. Nasal saline irrigation is started and continued daily until edema has improved. The patient is then often instructed on taping, which can continue for 6 weeks. Taping compresses the skin envelope to the underlying framework by decreasing postoperative edema, and has been reportedly helpful for thick-skin patients.²¹ Importantly, differential taping may be used if needed to help correct minor asymmetries. [See **Figure, Supplemental Digital Content 4**, which shows postoperative taping. (*Left*) A 15-year-old boy presented with a crooked nose with both functional and aesthetic concerns desiring correction. (*Center*) Early follow-up demonstrated a slight residual deviation of the tip and

expected persistent postoperative swelling. (*Right*) Instructions for nighttime taping were given to help with swelling and maintain tip straightening during the early phase of healing, <http://links.lww.com/PRS/E992>.] Although revision rates are typically low, the most common indication in the authors' experience is persistent nasal airway obstruction. Although most problems with obstruction are related to edema and resolve with time, surgical intervention is sometimes necessary. Revision surgery is performed 6 months to 1 year from the index procedure, and the surgeon can expect significant scar burden. Additional cartilage either from rib and/or auricular donor sites (or cadaveric cartilage) may be required, as the septum has often already been harvested.

PEDIATRIC PATIENTS

In any patient who is not yet skeletally mature, the “fourth dimension” of growth and development must be carefully considered. For infants and young children with crooked noses, deforming forces will continue to manifest as the patient grows and will often become progressively severe with time.⁸ For this reason, it may be in the patient's best interest to pursue treatment for a severely crooked nose before skeletal maturity. This is particularly important if the deformity is significantly impeding their airway, with the potential for worsening. However, this growth potential must be taken into account when performing open functional septorhinoplasty on pediatric patients. Skeletally immature patients who have undergone closed nasal reduction or formal open septorhinoplasty must be observed longitudinally to monitor for changes in nasal deformity and nasal airway with growth.

The full potential for nasal and septal growth following trauma and surgery has yet to be definitively argued. It is important to note that the septum can be electively repositioned and conservatively resected in infancy during primary lip repair without causing growth anomalies.²² Animal studies show conflicting data on nasal and midfacial growth after nasal and/or septal surgery, but clinical data indicate effects on nasal and midfacial growth after septorhinoplasty with preservation of mucoperichondrium are minimal to negligible.^{23,24} These data demonstrate that rhinoplasty including conservative septoplasty may safely be performed in the pediatric population. Indications for septorhinoplasty in the pediatric population include cleft lip and nasal deformity, traumatic injury resulting in clinically significant

Fig. 4. (Continued). Preoperative and postoperative photographs following reconstructive septorhinoplasty. (*Left*) A 17-year-old female patient with a significantly “crooked” nose who presented with functional and aesthetic concerns. Note the deviated dorsum and tip on frontal view, whereas the oblique view captures the significant degree of tip deviation. (*Right*) Six-month postoperative follow-up after septorhinoplasty demonstrates significant improvement in nasal shape. Again, key components of the operation included nasal osteotomies, including lateral (low-to-low) and medial, bilateral spreader graft placement, columellar strut graft placement, submucous septal resection, and inferior turbinectomy.

nasal airway obstruction, reconstruction after removal of a nasal lesion, sleep apnea, and chronic mouth breathing.^{23,24} Before undertaking this procedure, careful communication with the family is necessary to counsel the patient and family that the patient may require secondary rhinoplasty at skeletal maturity if the patient outgrows the repair over time.

CONCLUSIONS

Complete correction of the crooked nose is very challenging and often requires complete exposure and release of all affected structures, followed by reconstruction. The patient must be analyzed critically, then precisely treated, based on a problem-focused operative plan. The principles of treatment of the crooked nose are the same regardless of cause. Releasing all internal and external deforming forces, including aggressive and complete osteotomies, is often required. The nose must then be rebuilt, using rigid cartilage grafts to create a sound framework. Precise skin redraping, potential soft-tissue manipulation, and meticulous closure is essential for an aesthetic outcome. Adjunct maneuvers can be tailored to the specific patient's deformity. It is important to remember that the successful treatment of the crooked nose cannot be achieved with minor maneuvers and a limited approach, as this will inevitably result in undercorrection and/or relapse. Only an extensive reconstructive procedure that includes releasing then rebuilding the nose will consistently result in satisfactory correction.

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PATIENT CONSENT

Patients provided written consent for the use of their images.

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