

Management of the Crooked Nose

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ABSTRACT

Aim: To describe an approach for the diagnosis and management of patients presenting with crooked nose.

Background: Patients with crooked nose suffer from functional ailments, most significant nasal obstruction, as well as esthetic concerns which may impact their self-image as well as others' perception of them. As such, management of the crooked nose is an especially challenging task in that it demands careful attention to both nasal function and appearance. There are a plethora of surgical techniques which may be utilized, and the surgeon's approach must be tailored to each individual patient's presentation.

Technique: Accurate diagnosis is imperative for a successful outcome and relies on a thorough history and careful physical examination. Surgical intervention may be addressed by either an endonasal or open approach based on the location and severity of the deformity. It is helpful to break down the nose in vertical thirds when planning your surgical approach. Different techniques are used to address the upper third comprising the nasal bones, middle third composed of the upper lateral cartilages and septum, and the lower third composed of the lower lateral cartilages and caudal septum.

Conclusion: Management of the crooked nose is a technically challenging endeavor that highlights the need to address both form and function for a successful outcome. Effective treatment can significantly improve a patient's quality of life leading to a high level of satisfaction for both the patient and the surgeon.

Keywords: Crooked nose, Deviated nose, Nasal trauma, Rhinoplasty.

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INTRODUCTION

Successful management of a crooked nose requires addressing both the esthetic and functional elements,

while utilizing an individualized approach for each patient. Effective treatment begins with careful critical evaluation to determine the etiology, followed by precise surgical technique and thorough postoperative care. The nose, in its midline protruding position, is arguably the most prominent facial feature. As such, crookedness will impact a patient's attractiveness, their self-image, and others' perception of them. Additionally, patients with crooked noses often have functional issues, including nasal obstruction, nasal valve collapse, nasal drying due to turbulent airflow, and recurrent sinusitis due to obstruction of the ostiomeatal complex(es). Accordingly, patients stand to gain much from treatment in the form of a surgical intervention. They will benefit from both an improved esthetic as well as an improved nasal airway. The senior author's (FJS) experience over treating over 2000 crooked noses over his over 50-year career in facial plastic surgery and otolaryngology has made one of the world's most experienced surgeons in managing this condition.¹

RELEVANT ANATOMY

The upper third of the nose is composed of the paired nasal bones anteriorly and paired nasal processes of the maxilla posteriorly. The cephalic edge of the nasal bones articulates with frontal bone while the caudal edge articulates and overlaps with the paired upper lateral cartilages.

The upper lateral cartilages and septum comprise the middle third of the nose. The anatomy of the upper lateral cartilages, septum, and inferior turbinate creates the internal nasal valve. Dysfunction or deformity in any of these three elements may lead to compromise of the nasal valve and nasal obstruction. The shape, integrity, and position of the nasal septum hugely impacts the patency of the nasal airway, dictates the appearance of the external nose, and provides structural support for the nasal dorsum and nasal tip.

The lower third of the nose, also known as the nasal tip, is formed by the paired lower lateral cartilages, each of which contain a medial, intermediate, and lateral crus. The two medial crura combine to form the columella. The transition between the intermediate and lateral crus dictates the shape of the nasal dome while the position and integrity of the lateral crura provide support for the external nasal valve. The ala, forming the lateral wall of the nasal vestibule, is composed of skin overlying fibrofatty tissue and the sesamoid cartilage.

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The nasal cavity is lined by ciliated, pseudostratified, columnar epithelium, also known as respiratory epithelium. The mucosa serves to warm, filtrate, and humidify air that moves through the nasal cavity, while continuously pumping mucous toward the nasopharynx via the action of the cilia. Injury to the mucosa, from trauma and/or surgery, and conditions, such as tobacco use, rhinitis, sinusitis, and anatomic obstruction disrupt normal function of the cilia, leading to nasal crusting and obstruction. Airflow through the nose typically occurs in a laminar fashion. Alterations in normal internal anatomy, such as septal deviation or a septal perforation may cause turbulent airflow, which results in nasal drying, crusting, bleeding, and mucosal dysfunction.²

DIAGNOSIS

The first step in the diagnosis is obtaining a history of the presenting complaint. This should include previous trauma, nasal surgeries, congenital deformities, and appearance of the nose prior to any trauma or intervention. With the advent of social media and smartphones, most patients are able to readily access photographs of themselves from prior to injury. Although the perspective may not be ideal, they do provide useful information regarding the premorbid appearance of the nose. Also important is to illicit patient history regarding the use of intranasal medications, such as steroid sprays, topical decongestants, and current or past intranasal cocaine use. The patient's medical history should be reviewed to look for any conditions that may increase the risk of anesthesia and/or compromise wound healing, such as tobacco use, autoimmune disease, and poorly controlled diabetes. Finally, and perhaps most important, is to have the patient tell you in their own words their concern about the nasal appearance and/or nasal function.

Once a thorough history is complete, the next step in diagnosis is physical examination. The key to the physical examination of crooked nose is to determine which anatomic disruption(s) are contributing to the crooked appearance as well as which may be causing symptomatic nasal obstruction. Contemplating the nose in the anatomic thirds is helpful with this analysis and begins with visual inspection. When evaluating the patient via the frontal view, one should assess the integrity and symmetry of the brow tip esthetic lines, as well as the width of the nasal root and base, and relative position of the nose with respect to midline. One must keep in mind that the midline of a patient's face may deviate at multiple points. Examination of the nasal base allows evaluation of the alar base width, symmetry of the nostril size, and position of the columella and caudal septum. The lateral profile view is ideal for assessing position of the radix, nasal dorsum, as well as nasal tip projection and rotation. Photographs in

the six standard views (frontal, bilateral profile, bilateral oblique, and basal) are useful for preoperative planning and discussion with the patient, as well as for comparison postoperatively. A 7th view, top down, may be especially helpful in evaluating crooked nose. After visual inspection, a manual examination is important to assess for bony step offs, old fracture lines, length of the nasal bone, the presence of nasal septal cartilage, and stability of the nasal tip. The value of palpation of the nasal anatomy cannot be overstated. A modified Cottle maneuver should be performed to assess the integrity of the nasal valve. Finally, diagnostic nasal endoscopy is helpful to gain additional information regarding the internal nasal anatomy which may not be visualized with anterior rhinoscopy.

MANAGEMENT

Approach

As with any case of nasal obstruction, the first step in the treatment is medical management. Clearly, a fixed anatomical obstruction will not improve with medical therapy, but conversely persistent tissue inflammation may prevent the patient from experiencing significant symptomatic relief after surgical correction. Medical management of nasal obstruction is outside the scope of this study, which instead will focus on surgical management of the crooked nose.

Either the endonasal or open approach may be utilized when treating the crooked nose, depending on the location and severity of the deformity. Open approach may yield the greatest exposure to the nasal skeleton but also comes with more significant postoperative edema and a longer recovery. Endonasal approach allows access for osteotomies, cartilage grafting for camouflage as well as structural support, and may be performed in concert with a septoplasty. With reduced tissue dissection, postoperative recovery is faster and the external columellar scar is eliminated. Similar to the physical examination, it is helpful to break up the approach to surgical management of the nose by anatomic thirds.

Upper Third

A deviated bony upper third is managed with a combination osteotomies, rasping and camouflage with onlay grafting techniques. Both medial and lateral osteotomies may be needed, although sometimes one may be able to elevate the depressed bony nasal wall without a lateral osteotomy. In addition, an intermediate osteotomy may be needed for a severely deviated nasal bone. Medial oblique osteotomies should be performed first, followed by intermediate if indicated, and finally the lateral osteotomies are completed. The author (FJS) performs the lateral osteotomy using the high-low-high technique using a

nonguarded 2 mm osteotome, which provides the surgeon with the best control when creating the osteotomy while minimizing soft tissue trauma. Rasps may be used to reduce small dorsal humps and/or bony irregularities. While reducing a larger dorsal hump using an osteotome, one must take into account the length of the nasal bones and adjust the plane of excision accordingly. Generally speaking, less bone should be taken from the shorter nasal bone, which is on the side to which the nose is deviated.³ Rasping and reduction of a dorsal hump should be completed prior to performing osteotomies. Finally, grafts of crushed septal or auricular cartilage may be utilized to camouflage asymmetries not corrected with osteotomies and/or rasping.⁴ A diamond fraise is useful to fabricate the appropriate shape and quality of the cartilage graft.

Middle Third

The key to addressing the middle third of the nose is to focus on the functional elements such that the dorsal strut is maintained as is the integrity of the internal nasal valve. In addition to causing nasal obstruction, a deviated septum often plays a significant role in the crooked appearance of the nose and thus must be addressed. When using an endonasal approach to the nose the septum may be addressed in standard fashion through a hemitransfixion, full transfixion, or Killian incision. Careful attention must be paid to the dorsal septum as its shape often dictates the external appearance of the middle third of the nose. If the deviation of the middle third is minor it may be addressed using onlay cartilage grafts for camouflage through either an endonasal or open approach.⁵ If the dorsal segment of the septum is significantly deviated, it is best approached through an open rhinoplasty so that a dorsal strut may be reestablished. In this situation, an inverted V incision is made on the columella and connected to bilateral marginal incisions. The skin-soft tissues envelope is elevated, exposing the nasal skeleton. The anterior septal angle is identified and mucoperichondrial flaps are elevated bilaterally off the cartilaginous and bony septum. The upper lateral cartilages are then sharply separated from the dorsal septum with care to maintain the intranasal mucoperichondrial lining. These steps allow complete exposure of the nasal septum so that any deviations or structural weakness may be addressed. If the dorsal septum is absent or must be resected, it should be replaced with a dorsal strut graft to prevent saddling of the nasal dorsum. An alternative to resection is splinting techniques using unilateral or bilateral extended spreader grafts. Spreader grafts serve both as a functional and esthetic purpose as they serve to stabilize the internal valve, splint a deviated dorsal septum, and may correct a midvault concavity when created asymmetrically. For severe dorsal deformities,

these grafts may be created from the bony septum so that they may provide the strength needed to straighten a deviated septum.⁶⁻⁸ For correcting a midvault asymmetry to a thicker, or double, spreader, graft should be placed on the concave side.⁶⁻⁸ Spreader grafts should be secured using 5-0 polydioxanone suture, which is passed in mattress fashion through the dorsal septum, spreader grafts, and upper lateral cartilages. It may be helpful to stabilize the spreader graft–upper lateral cartilage–septum complex by passing a 28 gauge needle prior to suturing.⁹

At times, for the significantly deviated cartilaginous septum, an extracorporeal septoplasty is indicated. In this situation the entire cartilaginous septum is removed, with the exception of the dorsal bony–cartilaginous junction at the keystone area. Now outside the body the cartilage is modified by resection, carving, modification with a diamond fraise and suturing until a straight septum is achieved. Polydioxanone foil has proven to be beneficial in providing a scaffold on which to rebuild the reconstructed septum.¹⁰

Lower Third

When addressing deviations of the caudal third of the nose care must be taken to ensure adequate tip support is maintained. Caudal septal deviations may be addressed using a combination of cartilage scoring, the swinging door technique, and splinting with caudal septal splints or caudal septal extension grafts.⁷ When utilizing cartilage scoring the concave surface should be cross hatched to weaken that side of the cartilage. The swinging door technique is useful if the caudal septum is excessively long and lies off the maxillary crest. Once the cartilage is freed from the crest, bony septum, and bilateral mucoperichondrial flaps, it is free to swing back into a midline position. If it is still limited by excessive length, it may be trimmed judiciously at the inferior border. A suture may be passed through the bony crest to stabilize the caudal septum in the midline. Another method for the management of the deviated caudal septum is application of vertically oriented splints as long as their placement does not create obstruction of the airway. A final option is the use of a caudal septum extension graft which is especially useful in patients who would benefit from lengthening of the nose.⁷ A caudal septum extension graft extends from the caudal septum anteriorly and is interpositioned between the medial crura footplates. It is multifunctional in that it serves to set the caudal septum at midline, provides support to the nasal tip, and allows adjustment of tip rotation, projection, nasolabial angle and columella show based on the relative position of the medial crural footplates.⁷ Just as with the dorsal strut, it is imperative to maintain an adequate caudal strut to preserve support of the nasal tip. To ensure tip support will be maintained, columellar strut grafts may be fashioned from rib, septal,

or auricular cartilage, placed between the medial crura and secured with 5-0 polydioxanone suture. As mentioned previously, severe deviation affecting both the dorsal and caudal septum may require reconstruction with an extracorporeal septoplasty.

CASE REPORT

A 25-year-old male presented with a history of multiple nasal traumas and severe bilateral nasal obstruction. Examination revealed a crooked nose with depression of the left nasal bone and deviation of the middle third of the nose to the right, with associated concavity. Nasal endoscopy revealed an S-shaped deformity of the septum with significant deviation of the caudal aspect. On profile view there was a prominent dorsal hump, which the patient was not pleased with esthetically (Figs 1A to C).

The patient underwent surgical intervention via open rhinoplasty approach. Techniques utilized include medial and lateral osteotomies and reduction of a cartilaginous dorsal hump. The septum was repositioned using the swinging door technique, including resection of the most inferior 3 mm to allow the quadrangular cartilage to sit back on the midline maxillary crest. Bilateral spreader grafts were placed to stabilize the internal nasal valve and to splint the deviated dorsal septum. The concave side of the caudal septum was scored and it was sutured to the periosteum of the maxillary crest at midline. In addition, a caudal septal extension was created from conchal cartilage and used to splint the caudal strut and provide tip support.

Postoperatively, the patient experienced a significant improvement in his nasal airway and was quite pleased with the esthetic result (Figs 2A to C).



Figs 1A to C: (A) Frontal view demonstrating deviation of the nasal bones and middle third to the right as well as concavity of the middle third; (B) basal view demonstrating caudal septal deviation to the left; and (C) oblique view demonstrating prominent dorsal hump



Figs 2A to C: (A) Frontal view demonstrating correction of crooked nose appearance; (B) basal view demonstrating correction of the deviated caudal septum; and (C) oblique view demonstrating improvement of the prominent dorsal hump

CONCLUSION

Management of the crooked nose is a technically challenging endeavor which highlights the need to address both form and function for a successful outcome. It has both esthetic and functional implications and requires an individualized approach tailored to each patient's presentation. As such, a thorough evaluation leading to accurate diagnosis is imperative. Effective treatment can significantly improve a patient's quality of life leading to a high level of satisfaction for both the patient and the surgeon.

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