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Septoplasty: Endoscopic and Open Techniques

Yi-Tsen Lin

Abstract

Septoplasty is one of the most commonly performed procedures by rhinologists. This article will provide a brief review of the surgical anatomy and the operative techniques of this procedure. Both endoscopic and open septoplasty procedures will be addressed. However, more than 15% of patients undergoing septoplasty fail to achieve symptomatic relief. Incomplete separation of the bony-cartilaginous junction and inadequate correction of the caudal septal deviation are the main reasons for persistent septal deviation after primary septoplasty. In revised septoplasty, correction of the caudal septal deviation can be done by proper correction of the cartilaginous curvature and strengthening of the structure using a batten graft.

Keywords: nasal septum, septoplasty, endoscope, caudal septal deviation

1. Introduction

Septoplasty is one of the most frequently operated procedures by rhinologists and facial plastic surgeons. It is performed mainly for reducing nasal obstruction, but it can also provide a better surgical approach in endoscopic sinus and skull base surgery and an easier access for postoperative treatment. The deviated septum can be cartilaginous, bony, or both. The septum can be curved, tilted, angulated, twisted, present with a formation of spurs, or a combination of these. Therefore, there is no a single “standard” or “routine” operation that can satisfy all variables and complexities of cases. Septoplasty is a reconstructive procedure tailor-made for individual cases. Understanding the anatomy and a thorough preoperative evaluation of all deviated sites will lead to a better surgical outcome.

2. Surgical anatomy

The nasal septum is a vertical midline structure that extends anteriorly to the columella, posteriorly to the sphenoidal rostrum, superiorly to the anterior skull base, and inferiorly to the nasal floor (**Figure 1**). It composed of soft tissue, cartilage, and bone. The most caudal part between the columella and the caudal margin of the septal cartilage is the membranous septum, lying between the medial crura and the caudal septum. The area of the membranous septum may vary between individuals. In people with a large septal cartilage, the membranous septum might be smaller. The cartilaginous part of the nasal septum is quadrangular. It is in conjunction with the upper lateral cartilage and the lower end of the nasal bone anterosuperiorly, the perpendicular plate of the ethmoid bone superiorly, the vomer

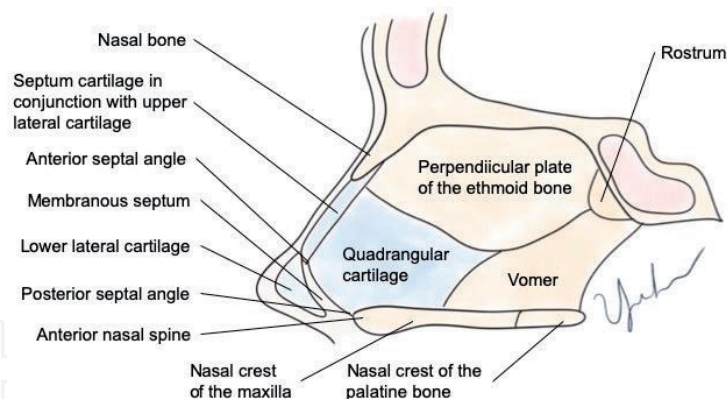


Figure 1.
The anatomy of the nasal septum.

bone posteroinferiorly, and the maxillary crest inferiorly. It usually presents with a tail between the gap of the perpendicular plate and the vomer, and this area is actually considered to be the growth center of the septum. The cartilaginous septum connects to the bony septum by a dense fibrous tissue and usually sits in a groove in the maxillary crest. The bony part of the septum includes the vertical crest of the nasal bone, the perpendicular plate of the ethmoid bone, the vomer, the maxillary crest, and the palatine crest. Because the septum at the bony-cartilaginous junction is the growth center of the nasal septum, we should keep in mind not to manipulate vigorously in this area before 17 and 18 years of age.

Some important landmarks of the nasal septum should be kept in mind when performing septoplasty to avoid unfavorable complications. The keystone area is the confluence of bone and cartilage at the junction of the nasal bone, the septal cartilage, and the upper lateral cartilages. The detachment of the cartilage from the bone and/or damage of the cartilage in the keystone area may cause a complication known as a saddle nose. Another important landmark is the junction of the caudal septum and the anterior part of the maxillary crest. There are three landmarks in the caudal ends of the septal cartilage: the anterior septal angle, middle septal angle, and posterior septal angle. The posterior septal angle contacts the anterior nasal spine, which is the most anterior part of the maxillary crest. Damage to the fibrous connection between the caudal septum and the anterior nasal spine may lead to weakened support of the nasal tip and an increased risk of nasal tip drooping. Usually, the septal cartilage should be preserved at least one 1–1.5 cm in width dorsally and caudally.

Deviation of the nasal septum can be classified as a caudal septal deviation, dislocation of the cartilage out of the maxillary crest, dorsal and high septal deviation, posterior septal deviation, and a bony spur formation. Various techniques have been proposed to deal with the distinct sites of septal deviation.

3. Surgical techniques

Septoplasty can be performed via a traditional headlight approach or by an endoscopic approach. The advantages of using an endoscope are a more accurate diagnosis of septal deviation, better visualization of the contributing factors, prevention of mucosal tears, and visualization of the surgical fields for residents and operating room staff. A systematic review reported that endoscopic septoplasty shortened surgery time and reduced perioperative complications, but the functional result was similar to that with conventional septoplasty [1]. Another

systematic review reported that there was a significant improvement in postoperative symptoms (i.e., nasal obstruction and headaches) and fewer complications in patients who underwent endoscopic septoplasty, although these findings should be taken with caution given the poor quality of included studies [2]. Consequently, nowadays, endoscopy has been adopted to perform septoplasty. Many surgical procedures of the nasal septum rely on endoscopes, including septodermoplasty [3, 4], repair of septal perforation [5, 6], and harvesting the nasoseptal flap for skull base reconstruction. The limitation of using endoscopy in septoplasty is correction of the deviated caudal septum. The caudal septal cartilage might be manipulated more easily via a conventional headlight (more details will be described later in this chapter).

3.1 Incision and elevation of the mucoperichondrial flap

Usually, the nose is packed with cotton pledgets soaked with epinephrine 1 mg/ml and 2% lidocaine, followed by a submucoperichondrial injection of 1% lidocaine with 1:100,000 of epinephrine. For better infiltration of the surgical plane and hydrodissection of the subperichondrial and subperiosteal planes, injection into multiple sites of the bilateral septum is performed. For correction of the deviated septum at the junction of the cartilaginous septum and vomer and removal of the bony spur, a Killian incision is made (**Figure 2**). For correction of the caudal septal deviation, a hemitransfixion incision is made to elevate bilateral mucoperichondrial flaps from the caudal septum and to enable straightening of the caudal septum, to add on a batten graft, and to fix the cartilage firmly on the anterior nasal spine (**Figure 2**). A #15 scalpel is used to make the incision, and the subperichondrial plane is identified and dissected. When making the hemitransfixion incision, a sharp instrument can be used first (e.g., a scalpel, Cottle, or iris scissors) to elevate the mucoperichondrial flap. After making the Killian incision, the mucoperichondrial flap can be elevated more easily using a scraping maneuver with a Cottle or Freer elevator. Beginning with a correct plane, the elevation of mucoperichondrial flap can proceed more smoothly. After meticulous separation of the septal mucosal flap from the bony-cartilaginous junction, the subperiosteal plane can be identified by advancing a blunt elevator or even using a suction tip underneath the flap. Usually, the bony-cartilaginous junction is where the septum is most deviated. It would be easier to elevate the flap superiorly and inferiorly to the most deviated and adhesive part and then perform the flap dissection from the most deviated part and/or the spur. Sometimes, as flap tears are unavoidable due to large deviated spurs, we may elevate the concave side of the septal flap first to make sure one side of the septal flap is intact.

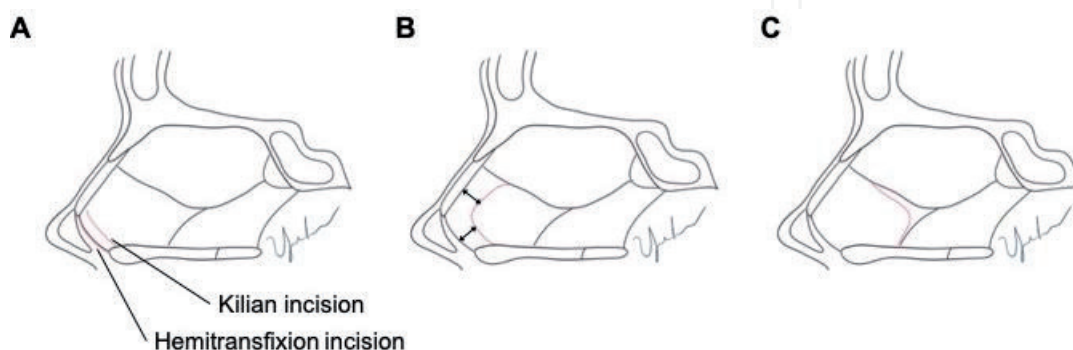


Figure 2.
The incisions in septoplasty. (A) The Killian incision and the hemitransfixion incision for mucoperichondrial flap. (B) The septotomy with an adequate preservation of the L-strut. (C) The septotomy made at the bony-cartilaginous junction.

3.2 Septotomy and removal the deviated part

The extent of the incised cartilage depends on the type of septal deviation. For a posterior bony septal deviation or spur formation, the cartilaginous septum may not need to be incised. You can separate the bony-cartilaginous junction during septotomy and enter the contralateral subperiosteal space. Then, the deviated bony septum could be removed precisely using turbinate scissors or through-cutting instruments. For the cartilaginous septal deviation, the septal cartilage may be incised anterior to the deviated part using a Freer septum knife, which can be used to cut the cartilage without injury to the contralateral septal mucosa. If the septal cartilage is to be used as a cartilaginous batten graft for subsequent procedures, it can be harvested using a Freer septum knife as well with an adequate preservation of the L-strut. Then, the contralateral mucoperiosteal flap is elevated, and the deviated bone can be incised using turbinate scissors, through-cutting instruments, or a rongeur.

3.3 Management of the deviation at the maxillary crest

Dislocation of the cartilage from the maxillary crest, widening of the maxillary crest, and a deviated maxillary crest are common causes of airway obstruction at the base of the nose. Sometimes, it could be left untouched if the problem is minor compared to other deviated problems, but at other times, it can be critical and surgical intervention is required. At the junction of the cartilaginous and bony components of the septum, dense decussating fibers are seen at the confluence of the perichondrium and the periosteum. Therefore, when dissecting the subperichondrial plane downward to the maxillary crest, sharp division of the fibrous connection at the cartilaginous-bony junction using a Freer septum knife is helpful. In case of dislocation of the cartilage from the maxillary crest, it is useful to remove a strip of cartilage lateral to the maxillary crest without destabilizing the junction of the caudal septum and the anterior nasal spine. For wide maxillary crests or the deviated crests, we may use a chisel to shave or smooth the bone surface.

3.4 Correction of caudal septal deviation

Aggressive resections of the cartilaginous portion of the septum may lead to loss of nasal tip support. However, inadequate correction of the caudal septal deviation is one of the main reasons for persistent septal deviation after primary septoplasty [7]. The caudal septum is mainly composed of the cartilaginous portion of the septum, and the relationship between the caudal septum and the anterior nasal spine is crucial in the management of caudal septum deviation. In addition, after correcting the curvature of the cartilage and adjusting the relative position of the caudal septum and the anterior nasal spine, the structures need to be strengthened using sutures and/or batten grafts (**Table 1**).

Correction of cartilage is different from correction of bone. Once the bony septum is fractured to be straight, the structure is broken, and it seldom recovers to the original shape. However, the elastic coiling nature of the cartilage renders it with a “memory,” which leads to cartilage re-bending even after suture or scoring. To overcome the intrinsic elasticity of the cartilage, Jang et al. proposed a cutting and suture technique [8]. The most convex part of the caudal cartilage is cut while preserving the junction between the cartilaginous septum and the maxillary crest, and then the two segments are sutured side by side with a slight overlap. If the stability of the cut and sutured septum is questionable, a cartilaginous batten graft can be used to provide further support.

To straighten the caudal septum	To strengthen the caudal septum
<ul style="list-style-type: none">• Scoring• Cut and suture• Wedge resection• Swing door• Septum riding on the spine	<ul style="list-style-type: none">• Anchoring sutures• Cartilaginous batten graft• Bony batten graft

Table 1.
Surgical techniques to correct the deviated caudal septum.

The structure of the caudal septum corrected by the cutting and suture technique can also be strengthened with an interpositioned graft [9]. Another way to break the intrinsic elasticity is to make an incomplete incision on the most concave site of the cartilaginous septum (**Figure 3A**). Then, a pair of forceps can be used to reposition the cartilage to the midline, and the excess piece of cartilage can be trimmed (**Figure 3B and C**). The septum can be sutured with a 5-0 PDS, and a batten graft can be used.

Dislocation of the lower part of the caudal septum on the side of the maxillary crest can narrow the airway and cause nasal obstruction, and this can be managed in several ways. As mentioned before, the cartilage along the maxillary crest could be shaved as a strip, but the stability of caudal septum may be affected due to loss of the fibrous connections between the cartilage and bone. Therefore, in addition to shaving the base of the cartilaginous septum, anchoring sutures between the cartilage and the soft tissue around the nasal crest can be used to strengthen the stability. Another solution to correct cartilaginous septal deviation is to disarticulate the cartilage from the maxillary crest, and the excessive cartilage can then be resected. Following this, the caudal cartilaginous septum could be replaced in the midline or fixed on the other side, and stabilizing sutures can be used.

While the above techniques are used to correct the curvature of the septal cartilage, additional batten grafts are used to strengthen and stabilize the structure and maintain a longstanding straightened caudal septum. The batten grafts can provide a strong support to overcome the internal coiling strength of the deviated cartilage and also prevent possible nasal tip drooping due to aggressive septation of the bony-cartilaginous junction. The batten grafts can be taken from either the cartilaginous septum [10, 11] or the perpendicular plate of the ethmoid bone [12–14], and it can be performed endonasally. The bony grafts do not cause internal nasal valve obstruction, and the cartilage grafts can be beveled to avoid excessive thickness of the caudal septum.

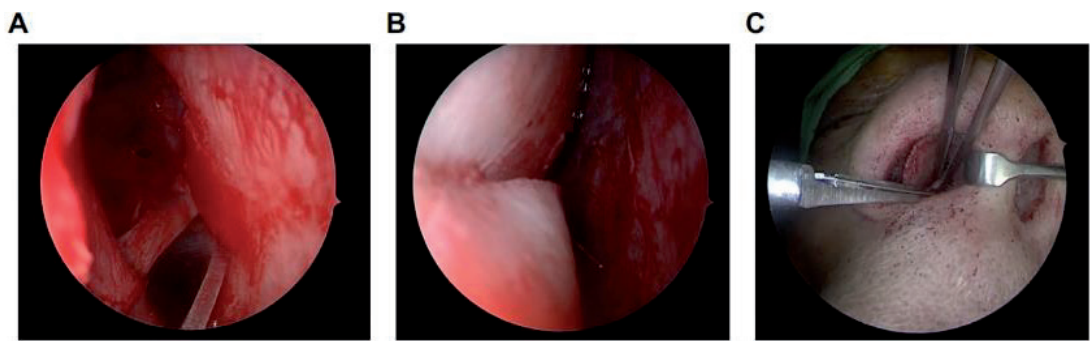


Figure 3.
Correction of the caudal cartilaginous curvature. (A) Making an incomplete incision on the most concave site of the cartilaginous septum. (B) Estimating the overlapping cartilage by repositioning the cartilage to the midline. (C) Trimming of the excess cartilage.

3.5 Wound closure

A reassessment of the nasal airway can be performed after completing the above procedures, and any minor adjustments can be addressed. Then, the septal flap is reapproximated. The hemitransfixion or Kilian incision is closed with simple interrupted 4-0 chromic sutures. The septum can be closed with a through-and-through quilting 4-0 chromic suture, which eliminates dead space and prevents development of septal hematoma. If mucosal tears are present, the silastic splints can be placed at each side of the nasal cavity and removed in 5–7 days.

4. Conclusion

Septoplasty is an individualized procedure, and preoperative evaluation of the deviated site is critical to achieve optimal outcome. Endoscope can provide better visualization of the deviated sites and prevention of mucosal tears, while the deviated caudal septum could be managed via hemitransfixion incision under headlight. Combining the use of headlight and endoscope can deal with most of the deviated sites of the nasal septum, and therefore, septoplasty could be performed endonasally in most of the cases. Open septoplasty may be indicated in cases with deviated or crooked nose, and septoplasty with rhinoplasty can be performed. The surgical intention is to make a straight septum with long-lasting effect.

Conflict of interest

The authors declare no conflict of interest.

Appendices and nomenclature

nasal septum
septoplasty
endoscopic septoplasty
caudal septal deviation
Kilian incision
hemitransfixion incision

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