

Rhinoplasty Refinements: Revision Rhinoplasty Using Fresh Frozen Costal Cartilage Allograft

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Summary: A crooked nose is challenging for a surgeon and needs to be treated using a systematic approach. Correction of nasal deformities such as a retracted columella in a revision rhinoplasty may need additional cartilage to correct the framework. Fresh frozen cartilage graft has been used as an extended spreader graft and a columellar strut graft to correct this problem. This option prevents donor-site morbidity associated with harvesting autologous cartilage. (*Plast. Reconstr. Surg.* 145: 1050e, 2020.)

In this article, we highlight a revision rhinoplasty to treat commonly found secondary deformities after rhinoplasty. The patient shown in this article has a crooked nose and columellar retraction. These are very challenging deformities to address, and we show our approach with the use of fresh frozen cartilage allografts to correct these deformities.

A crooked nose may be congenital or a secondary deformity as a result of trauma or prior surgery. There are many extrinsic and intrinsic forces that produce nasal distortion and deviation.¹ We have broadly classified nasal deviations into caudal septal deviation, concave dorsal deformity, or convex dorsal deformity.^{2,3} The senior author (R.J.R.) has described eight key operative principles in treating the crooked nose: (1) wide exposure of deviated structures; (2) release of submucoperichondrial attachments; (3) straightening the deviated septum followed by septal reconstruction; (4) correction of the caudal septal deviation; (5) correction of dorsal septal deviation; (6) restoration of septal support; (7) microfracture of the inferior turbinates; and (8) nasal osteotomies.⁴

A retracted columella is defined when the posterior two-thirds of the columella is superior to the alar margin, so that the columella is not visualized from the profile view.⁵ The primary iatrogenic cause of this deformity is overresection of the caudal septum, anterior nasal spine, or medial crura. One method to correct a retracted columella caused by overresection or weakening of the

cartilage is placement of a columellar strut graft to reconstruct the columella and stabilize the tip.

Autologous cartilage has been the preferred cartilage graft material in revision rhinoplasty and is primarily harvested from the rib because the ear and nose typically have insufficient cartilage.⁶ The donor-site morbidity associated with rib harvest prompted the use of irradiated cartilage.⁷ Wee et al.⁸ have reported that irradiated cartilage had a higher incidence of resorption and infection compared with autologous cartilage, thereby resulting in poor patient satisfaction and higher complication rates. This study also showed that irradiation causes decreased chondrocyte viability.

The use of fresh frozen cartilage graft avoids the donor-site morbidity associated with rib harvest and obviates the issues (i.e., resorption and infection) associated with irradiated cartilage.⁹ It shows promise as a useful source of graft material in revision rhinoplasty, and the senior author (R.J.R.) has used it in approximately 50 revision rhinoplasties over a 2-year period. In our experience, we have not noted any cases of resorption,

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Table 1. Comparison of Grafts

Characteristic	Septal	Costal	Conchal	Irradiated	Fresh Frozen
Amount	++	+++	+	+++	+++
Donor-site morbidity	--	++	-	N/A	N/A
Warping	-	+	+	++	+
Ease of harvest	++	-	+	N/A	N/A
Structural support	+	++	-	+	+
Scarring	---	++	+	N/A	N/A
Operative time	-	++	+	-	-
Ease of carving	++	+	-	++	++

+, increased; -, decreased; N/A, not applicable.

but one patient did have infection associated with the graft material (Table 1).

DESCRIPTION OF PROCEDURE

A 28-year-old woman presented who desired revision rhinoplasty and had a significant secondary nasal deformity (Fig. 1). [See Figure, Supplemental Digital Content 1, which shows the patient who underwent open secondary rhinoplasty through a transcolumellar approach. Bilateral percutaneous osteotomies were performed to balance the dorsal aesthetic lines. The tip projection and rotation were controlled using the placement of an extended spreader graft and a columellar strut graft made from fresh frozen allografts. The tip was refined using cephalic trim; butterfly graft placement; and transdomal, intercrural, and interdomal sutures. Alar contour grafts were placed to support the external nasal valve, <http://links.lww.com/PRS/E82>. See Video 1 (online), which highlights the key portions of the revision rhinoplasty technique using fresh frozen allograft to address a crooked nose with a retracted columella. The first video in this series features a detailed analysis followed by the incision and approach in an open rhinoplasty. Portions of the component dorsal reduction are shown along with exposure of the anterior septal angle.] Under general anesthesia, the patient's nose was infiltrated with 10 cc of 1% epinephrine with 1:100,000 epinephrine. Through a stairstep transcolumellar incision with infracartilaginous extensions, the cartilaginous framework was exposed in a supraprimerichondrial plane. Part of the subcutaneous fat of the nasal tip was removed. Subperiosteal dissection in the midline of the patient's nose was performed.

While trying to identify the anterior septal angle, the medial crura were found to be very weak on both the sides, and deviation of the dorsal nasal structures was noted. A submucoperichondrial plane was developed after identifying the anterior septal angle by using a no. 15 blade and a Cottle elevator. The upper lateral cartilages were separated from the mucoperichondrium on both sides. Then,

a component dorsal reduction was performed, followed by a cephalic trim. These maneuvers helped correct any dorsal irregularities and the boxy tip. Percutaneous osteotomies were performed on both sides to align the nasal pyramid and straighten the nose. [See Video 2 (online), which shows the senior author's percutaneous osteotomy technique. Then, the fresh frozen cartilage allograft is carved and used to fashion different grafts to straighten the nose and correct the retracted columella.]

An extended spreader graft was placed on the right side to establish the relationship between the upper lateral cartilages and septum. It also helped straighten the crooked nose and reestablish the patient's dorsal aesthetic lines. Because the patient did not have adequate autologous septal cartilage to use as graft material, fresh frozen costal cartilage allograft made by the Musculoskeletal Tissue Foundation (Edison, N.J.) was used. A columellar strut graft was used to bolster the weak medial crura, and intercrural sutures were used to fix the floating columellar strut graft in the place. The columellar strut graft was then sutured to the extended spreader graft using figure-of-eight sutures and to the lower lateral cartilages using transdomal sutures. This construct helped straighten the tip and reconstruct the columella. The length of the extended spreader grafts depends on the nasal length, and enough cartilage is needed to suture the spreader graft to the columellar strut.

External sutures were used to reduce the flaring of the medial crura. [See Video 3 (online), which shows the details of tip refinement. A number of suturing techniques are exhibited along with placement of a butterfly graft. The meticulous closure of the open incision is shown.] A butterfly graft was sutured to the infratip lobule to provide a smooth transition and contour of the tip and soft triangle. Alar contour grafts were inserted to support the external nasal valve. The soft-tissue envelope was then redraped to assess the contour and alignment of the nose. The columella was closed using 6-0 nylon sutures, and intranasal incisions



Fig. 1. A 28-year-old woman presented who desired aesthetic correction of her nose and improvement in her internal nasal airway breathing problems after a prior rhinoplasty. The patient underwent secondary open rhinoplasty to treat her deviated nose and sculpted appearance of her tip. Her postoperative results (4 months after surgery) show a straighter dorsum with improvement in her nasal tip appearance.

were closed with 5-0 chromic suture while sparing the soft triangle to avoid any soft-tissue distortion. An internal splint was applied bilaterally and secured with 4-0 nylon. Gauze impregnated with antibiotic ointment (Surgicel; Ethicon, Inc., Somerville, N.J.) was applied in the soft-tissue triangle to close the dead space.

CONCLUSIONS

This case illustrates the need to carefully analyze, plan, and systematically implement the key operative principles when treating a crooked nose. Overzealous resection of the cartilaginous framework during primary rhinoplasty can result in nasal deformities such as a retracted columella. This case shows one approach to correct a retracted columella by using a columellar strut and an extended spreader graft. Secondary rhinoplasties frequently require cartilage grafts to rebuild the cartilaginous framework, and fresh frozen cartilage cadaver grafts are a promising source of cartilage graft material. However, future study is needed to understand the long-term efficacy and complications associated with fresh frozen cartilage allografts.

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PATIENT CONSENT

The patient provided written consent for the use of her images.

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