Oblique Split Technique in Septal Reconstruction

Eren Tastan, MD[1] Tevfik Sozen, MD[2]

[1] Department of Ear, Nose, and Throat, Ministry of Health, Ankara Training and Research Hospital, Ankara, Turkey
[2] Department of Ear, Nose, and Throat, Hacettepe University, Faculty of Medicine, Ankara, Turkey

Address for correspondence Eren Tastan, MD, Department of Ear, Nose, and Throat, Ministry of Health, Ankara Training and Research Hospital, Ankara, Turkey (e-mail: drerentastan@gmail.com).

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Abstract

The septum is considered to be the most important anatomical structure in providing nasal support. Because of a variety of potential etiologies nasal septum could be severely deformed or even diminished. Autogenous cartilage has generally been considered the gold standard grafting material in reconstructive septal surgery for creating the infrastructure of the nose. In the restructuring of the nasal skeleton autogenous cartilage can be harvested from the auricle or the rib. For the major septal problems requiring a large volume of tissues with severe structural defects costal cartilage is considered the best graft material. Apart from its advantages, warping has been the main problem with costal cartilage grafting. Oblique split method, provides straight costal cartilage grafts of varying thicknesses without the risk of warping. Segmental reconstruction of the L-strut with oblique split method, composed of dorsal and caudal struts, enables fine adjustment of height of the reconstructed septum.

Keywords
- nasal septal reconstruction
- costal grafting
- saddle nose
- L-strut
- warping

The major obstacle for septal reconstruction surgery in the previously traumatized or operated septum is the availability of septal cartilage. A variety of materials, exogenous or autogenous, have been proposed for septal grafting.[1] Autogenous grafts, the more commonly used alternative, may be harvested from auricular conchal or rib cartilage. Often, extensive grafting is required necessitating a costal harvest. While costal grafts provide abundant cartilage they have a tendency to warp over time, which may translate into long-term failure for a septal reconstruction procedure.[2] A novel costal cartilage carving technique called "oblique split method (OSM)," introduced by the authors stands to eliminate warping by dividing the graft obliquely to provide equal circumferential forces of contracture.[3] In this article, this novel technique will be illustrated by the presentation of surgical technique and intra- and postoperative photographs of two patients (one open and one endonasal approach) operated for revision septorhinoplasty.

Method

The operation was performed in 69 patients. All had significant septal support problems due to previous surgery or nasal trauma. All of the septum reconstructions performed with the costal cartilage grafting. Seventh rib cartilage was used for grafting. An endonasal ($n = 21$) or open ($n = 48$) approach was used with the patient under general anesthesia. Appropriate informed consent was obtained.

Surgical Technique

Main purpose of our technique is to have straight, thin, adjustable, but durable costal grafts and reconstruct the nasal infrastructure suitably.[3] Superoinferior caliber of rib determines the length and anteroposterior caliber determines the width of the graft carved by OSM. Jung et al reported the seventh rib having the greatest anteroposterior caliber and length.[4] Therefore, a straight segment of the seventh rib is preferred; the right side is harvested for the surgeon's convenience. Around 3 to 4 cm of the rib segment is considered to be sufficient for any nasal deformity. A proximal and distal disc–shaped segment is excised from both ends of the rib segment according to the planned graft length. The over- and underlying perichondrium is elevated circumferentially and the costal cartilage is removed to be sculpted on the back table. A cross-sectional graft is obtained by splitting the rib

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with a high profile microtome or dermatome blade in an oblique fashion to the long axis of the rib. Dividing the cartilage at 30 degrees to the long axis will result in a graft length roughly two times the superoinferior caliber and longer grafts may be achieved just by dividing the rib at lower angles. The resulting cartilage segments may be trimmed on their edges or cut to the desired length and shape without causing eventual warping.

Septal mucosal flaps are elevated in a standard fashion through either through an open or closed approach and the cartilage remnants are exposed. Depending on the presence of a caudal or dorsal cartilage strip, the remaining framework may be reinforced or rebuilt with a segmental reconstruction graft. Segmental reconstruction enables the fine adjustment of the height and length of the new septum.[5]

Case 1

A 41-year-old male patient referred to our clinic with a history of previous septal surgery and obvious nasal obstruction. He had saddle nose deformity due to aggressive resection of the cartilaginous septum (►**Fig. 1A–H**). For the reconstruction of the nasal septal cartilage, seventh rib was harvested. Cartilage graft material prepared via OSM.[3] The septal remnant was deficient in height and length because of over resection at the caudal end and the nasal base. There was a short dorsal septal remnant resting on nasal base posterior to the nasal spine. The anatomic continuity of residual dorsal septum was intact at the key area region.

To reconstruct the septum, OSM grafts of 1 to 2 mm thickness and 30 mm in length were prepared (►**Fig. 1I, J**). Two OSM grafts carved into suitable shape as spreader grafts, held in proper position with 22-gauge needles and fixated with 4/0 polydioxanone (PDS, Ethicon Inc., Bridgewater, NJ). Grafts were fixated in an overlapping fashion to the dorsal edge of the septal stump at the key area region (►**Fig. 1K**). Caudal septal reconstruction was performed by a partial overlapping of an OSM graft on the left side of the caudal septal remnant. The OSM graft is also sutured to the anterior nasal spine periosteum (►**Fig. 1L**). After fixating the caudal septal strut in the desired position, the dorsal height of the septum is determined by shifting the spreader grafts anteriorly and held in place with 22-gauge needles (►**Fig. 1M**). Fixation of caudal and dorsal strut grafts accomplished with 4/0 PDS. The spreader grafts overlapped with the septal remnant cephalically only. At the caudal part of newly designed L strut spreader grafts sutured to the caudal strut in a higher position then septal remnant. Nasal mucosa shifted anteriorly for determining the height of maximum appropriate nasal passage. At this level, spreader grafts and caudal strut were sutured together with 4/0 PDS. For minimizing the bulk in the valve area a step-off fixation is favored. Another OSM graft was sutured to the anterior edge of the caudal strut as an extension graft and a thin piece of OSM graft

Fig. 1 Reconstructing the septum with oblique split method (OSM) grafts. (**A–D**) Preoperative and (**E–H**) postoperative 28th-month view of case 1. Reconstruction of septum was followed by placement of a thin piece of dorsal onlay OSM graft. (**I,J**) A 45 degrees oblique split to the long axis of the rib. The grafts are straight and flexible. (**K**) Spreader grafts were fixated to the dorsal edge of the septal stump at key area region. (**L**) OSM graft partially overlapped on left side of the caudal septal remnant, and fixated to the anterior nasal spine. (**M**) Newly designed L-strut spreader grafts were sutured to the caudal strut in a higher position than septal remnant. (**N,O**) spreader grafts and caudal strut were sutured together, and a thin piece of OSM graft was overlapped at the septal base with both the grafts to provide more rigid fixation.

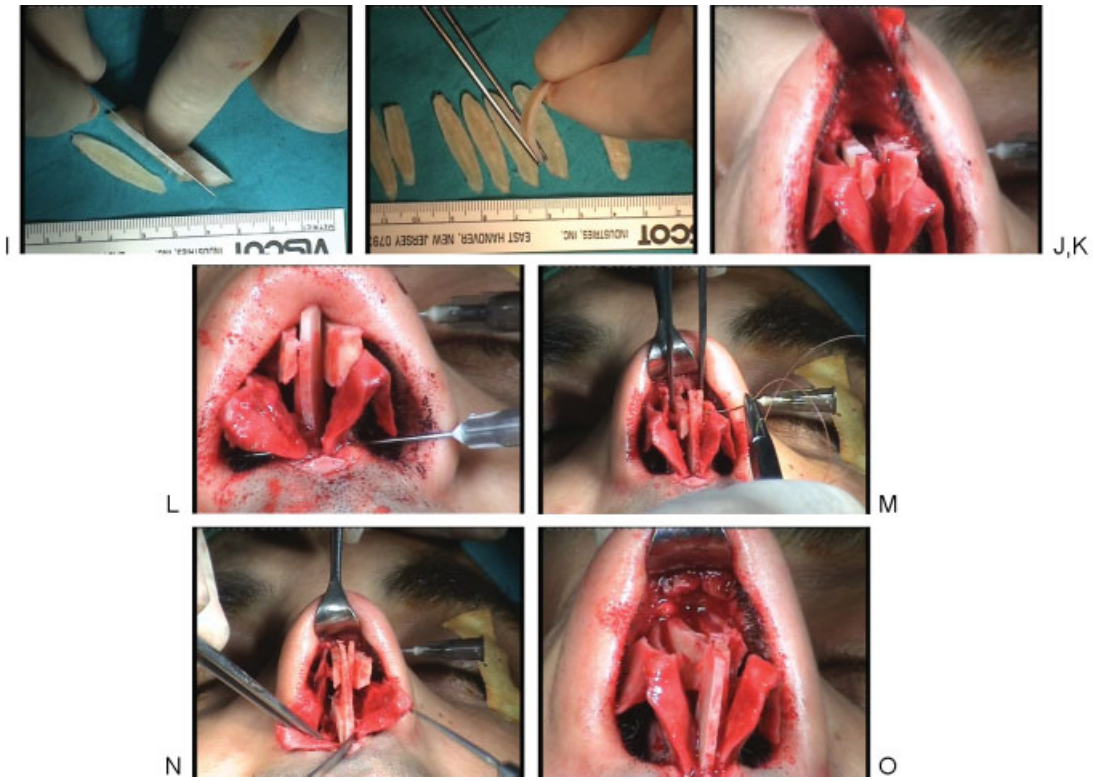

Fig. 1 (*Continued*)

was overlapped at the septal base with both grafts to provide more rigid fixation (►**Fig. 1N, O**).

Case 2

A 39-year-old female patient referred to our hospital due to nasal obstruction and aesthetic complaints. It was noted that she formerly had three open technique septorhinoplasty operations (►**Fig. 2A–H**). Another open approach was not planned because of dorsal skin compromise due to dermal injury and irregular scarring. She had a revision septorhinoplasty operation with a closed approach. The patient's nasal bony structure and septal cartilage was defective due to the resection in former operations. The seventh costal cartilage was harvested for septal reconstruction. The cartilages were prepared with the OSM. Mucosal flaps were highly fibrotic and elevated after right hemitransfiction incision. Due to the previous interventions nasal spine and quadrangular cartilage were missing. The L-strut was reconstructed on the operating table (►**Fig. 2I**). The pocket that is tight enough for the cephalic part of dorsal strut has to be prepared in the fibrotic tissue plane. Upper lateral cartilages were dissected and the cephalic part of the dorsal strut was placed between them. Caudal part of L-strut is fixated to fibrotic tissue in the formerly nasal spine area with 4/0 polydioxanone suture. At the end a relatively stable L-strut reconstruction is achieved. A separate cartilage was placed on the same plane as an extension of caudal septum and they were fixed together with a thin piece of OSM graft at the septal base.

Lateral crural strut grafts were placed to support the defective lateral crura. With a limited marginal incision a pocket elevated on the tip area, crushed cartilage, and costal perichondrium was placed to provide the definition and projection of the nasal tip. To obtain a dorsal onlay graft in sufficient width, two cartilage grafts were sutured side-by-side. After beveling the edges of the grafts costal perichondrium sutured over the dorsal onlay graft to camouflage the transition between the grafts. The suture fixation of dorsal onlay graft accomplished with 4/0 PDS to the underlying cartilaginous nasal skeleton caudally. Redundant cartilage segments were banked between the septal mucoperichondrial flaps as these straight and thin grafts will provide additional support to the septum without the risk of airway obstruction.

Discussion

Missing septal cartilage causes aesthetic and functional problems, which are hard to correct. In such patients costal cartilage grafts will be required for the structural support.[6] Reconstructed septum should be as thick as natural septal cartilage, strong enough and should be favorably straight. Septal thickness measurements demonstrated significant differences along the nasal septum, with the greatest thickness along the septal base, followed by intermediate thickness along the septal dorsum, and the least thickness along the central portion and at the anterior septal angle.[7] The most important disadvantage of the balanced cross-sectional

Fig. 2 (**A–D**) Preoperative and (**E–H**) postoperative 13th-month view of case 1. Reconstruction of septum was followed by placement of alar batten, side-by-side sutured dorsal onlay oblique split method grafts, and onlay tip graft. (**I**) L-strut was reconstructed on the operating table.

carving method is the warping problem.[2,8] As the graft gets thinner the warping tendency increases.[9] However, the rhinoplasty surgeon needs straight grafts in varying thickness. The costal cartilage graft of 1 to 1.5 mm thickness has the same tensile strength as the septal cartilage.[10] It is important that the reconstructed septum must be as thin as possible for not obstructing the nasal passage. Another important advantage is that the new L-strut should be heightening and widening the nasal passage as much as the nasal mucosa lends itself. In the conventional balanced cross-sectional carving method, the monoblock graft is kept thick to minimize the risk of warping. Its height is limited with the superoinferior thickness of the rib, which will limit the height of the reconstructed septum. Another disadvantage of the monoblock graft is that it causes the stiffness of the nose.[11] The most important advantage of OSM is preventing the warping problem so you can provide thin grafts even 1 mm in thickness without risk of warping.[3] In this technique numerous cartilage grafts can be provided as it uses both peripheral and central part of the rib. Except for dorsal onlay and L-strut grafts, all grafts which are necessary in rhinoplasty can be obtained from a single piece of OSM graft.[3] The segmental reconstruction is required for the dorsal onlay and L-strut grafts.[5] Although, connecting several cartilage pieces

seems time-consuming, preparing the dorsal and caudal segment of L-strut separately is advantageous to be able to adjust the height of the reconstructed septum. The required length of the dorsal component determines the length of the dorsal strut. When constructing the caudal strut, two pieces of OSM grafts are sutured together for the desired width. If a stronger fixation is desired a thin graft can be sutured on one side in an overlapping fashion. The stabilization of the dorsal strut at the key area region is provided by suture fixation to the septal stump, or to the nasal bones. The main goal in septal reconstruction is to rebuild the normal septal structure which is diminished somehow. By doing this septal height should be regained for functional nasal passage. Reconstructed L-struts cephalic edge has to be fixated to the Key area. The caudal part of the dorsal strut has ability to move in an anterior direction as the mucosa permits. Sometimes due to the defectiveness of the nasal structures it might be a challenging procedure to fixate the cephalic part of L-strut. In such kind of patients, a meticulous dissection of a tight fitting tunnel in required width and depth provides practical solution for fixation. Segmental reconstruction with thin and strong grafts will provide flexible and more functional nose then compared with the monoblock costal reconstruction. OSM provides the required thin and straight grafts. Reconstructing the new septum is easy and problem-free with this technique and what determines the result is now the quality of the skin and mucosa.

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