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What is This?
Septal Perforation Repairing with Combination of Mucosal Flaps and Auricular Interpositional Grafts in Revision Patients

Umit Taskin, MD¹, Ozgur Yigit, MD², Sezim A. Sisman, MD²

No sponsorships or competing interests have been disclosed for this article.

Abstract

Objectives. To examine the closure of nasal septal perforations with bilateral nasal floor flaps combined with auricular cartilage grafts and a normally functioning nose in revision patients.

Study Design. Case series with chart review.

Setting. A tertiary referral hospital in Turkey.

Subjects and Methods. Seventeen patients (11 men, 6 women) with nasal septal reperforation were treated surgically using combined bilateral nasal floor mucosal flaps with bilateral auricular cartilage interpositional grafts.

Results. The mean follow-up was 15.2 (range, 9-28) months. The average anteroposterior diameter of perforation was 28 ± 3 (range, 20-38) mm, and the average vertical diameter was 23 ± 8 (range, 20-27) mm at the widest site. The nasal septal perforations were closed completely in 16 cases; in 1 case, the perforation was not repaired completely.

Conclusions. A successful multilayer closure technique with good exposure was applied in patients with reperforation.

Keywords
nasal septal perforation, nasal floor flap, auricular cartilage graft, reperforation, perforation repair

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Nasal septal perforations, which are a discontinuity of the nasal septal mucosa, cartilage, and bone, have many causes, including digital trauma, recurrent epistaxis, improper cauterization of the nasal mucosa, drug abuse, iatrogenic perforations following septal surgery, and granulomatous and systemic diseases.¹,² Patients with nasal septal perforations suffer from recurrent epistaxis, nasal crusting, nasal obstruction, rhinorrhea, and bad odor. Ointments, saline sprays, nasal irrigation, humidifiers, and septal prosthetic buttons are used in the medical treatment of nasal septal perforation. Many surgical techniques have been performed in cases in which there is no symptomatic improvement after medical treatment, including rotation flaps,³ mucosal flaps,⁴ lateral nasal wall flaps,⁵ and free flaps. Because no single procedure repairs all perforations perfectly,⁶ nasal septal perforation closure remains a surgical challenge. Reperforations, the recurrence of perforations following surgical repair, are still a problem, especially with larger perforations. Although the literature contains many reports of the surgical repair of primary nasal septal perforations, with varying success rates,⁷ there is no report on the surgical methods and results in revision patients.

Thus, we examined the closure of nasal septal perforations and the restoration of normal nasal function in revision patients. The surgical method of repair that we present is easy, offers good exposure, has favorable outcomes, and is relatively inexpensive. This article also reports long-term surgical results in reperforated patients.

Materials and Methods

Ethical approval was obtained from the Istanbul Education and Research Hospital Ethics Committee. Informed consent was obtained from all patients preoperatively.

Seventeen patients (11 men, 6 women) with nasal septal reperforation were treated surgically using combined bilateral nasal floor mucosal flaps with bilateral auricular cartilage interpositional grafts between January 2005 and February 2010. The patients were reviewed retrospectively. Previous nasal surgery was responsible for all of the nasal septal perforations. All patients had undergone previous surgery to repair a nasal septal perforation, and 3 had been operated on twice to close perforations. Because all of these operations had been

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performed by other surgeons, there were no records showing the previous locations or sizes of the nasal septal perforations or the previous surgical methods. Patients with other possible causes of nasal septal perforation, including drug abuse and systemic or granulomatous diseases, were excluded from the study.

Preoperatively, patient complaints and the size and location of the nasal septal perforations were documented with an endoscopic nasal examination. The anteroposterior and vertical lengths of the perforations were calculated at the widest part. The location of the perforations was reported as anterior (cartilage defect only), posterior (bone defect only), or combined (both cartilage and bone defects). Computed tomography was performed to rule out the presence of sinonasal disease and to define the remaining nasal skeleton.

Patient complaints, the presence of nasal septal perforation, improvement in perforation size, and duration of follow-up with complications were evaluated postoperatively.

**Surgical Technique**

After endoscopic analysis of the nasal septal perforation, general anesthesia was induced, and a mixture of 1:100,000 adrenaline and 2% lidocaine was infiltrated to control bleeding during the operation. All of the operations were performed via an external approach by the same surgeon. First, the perforation borders were incised completely with a sickle knife. After elevating the nasal dorsum through a reversed V incision, the caudal edge of the septum was exposed after complete division of the intermediate crural and interdomal ligaments. The mucoperichondrial and mucoperiosteal flaps were elevated from the remaining nasal septum bilaterally without creating a new tear. The anterior, superior, posterior, and inferior tunnels were exposed carefully. The elevation of the mucoperichondrium was extended inferiorly along the nasal floor close to the attachment of the inferior turbinate. The nasal floor mucosa was incised circumferentially, up to the anterior attachment of the inferior turbinate to produce a larger flap. For posteriorly located perforations, the longitudinal incision was made posteriorly along the inferior turbinate close to its attachment to enable extension of the flap through to the nasal septal perforation. The flaps remained intact to the posterior part of the nasal floor mucosa and septum. The width of the flaps was at least 2 to 3 mm larger in diameter than the nasal septal perforation size to prevent tension on the flaps after suturing. If there was still a septal deviation, a septoplasty was performed at the time. Subsequently, auricular cartilage grafts were harvested bilaterally. Most of the cymba and concha was harvested, depending on the size of perforation. The concave faces of the auricular cartilage grafts were attached and sutured to each other to obtain a straight, strong, and larger graft. The length of the new auricular graft was prepared to be as large as the septal cartilage and bone defect if possible (Figure 1). The sutured auricular cartilage graft was placed in the nasal septal defect and sutured to the remaining septal cartilage as firmly as possible (Figure 1). To stabilize the flaps and the auricular and septal cartilages, transseptal 4-0 absorbable Vicryl sutures were inserted at no more than 1-cm intervals (Figure 2). The external skin incisions were sutured, and silicone sheets were inserted for 1 week to improve the recovery of the septal mucosa. Nasal packing was left for 48 hours to help the adhesion of the mucosal flaps postoperatively. An external splint was made and left in place for 1 week.

**Results**

Patient clinical data are summarized in Table 1. Six patients were female, and 11 patients were male. The mean age was 39.11 (range, 26-58) years. The mean follow-up was 15.2 (range, 9-28) months. All of the patients had a history of
septoplasty and previous surgery to repair a nasal septal perforation. All nasal septal perforations were large (>2 cm). The average anteroposterior diameter of the perforations was 28 ± 3 (range, 20-38) mm, and the average vertical diameter was 23 ± 8 (range, 20-27) mm at the widest site. Fourteen cases had combined cartilage and bone defects, so the anterior and posterior portions of the nasal septum were involved in these cases.

The nasal septal perforations were closed completely in 16 cases. In 1 case, the perforation was not repaired completely. This failed patient had a posteriorly located 33-mm-wide perforation preoperatively. Although a 10-mm perforation was still present, it was asymptomatic and did not need another operation. Two patients complained of nasal obstruction and crusting, although there was no reperforation. Another patient complained of nasal dryness. The remaining 13 patients were symptom-free.

**Discussion**

Although nasal septal perforation is common, most cases are diagnosed incidentally. Generally, the larger and more anteriorly located the septal perforation is, the more likely the patient is to have nasal symptoms.8 Although medical treatment is the first choice in the treatment of perforations, surgery is required when the treatment does not eliminate the symptoms. The main aim of septal perforation surgery is to restore normal nasal physiology.

Nasal septal perforation repair remains challenging, although many surgical techniques have been described for the repair, depending on the location and size of the perforation.9 These include external advancement,10 endonasal,2 sublabial,11 and midfacial degloving12; endoscopic closure with rotation flaps,3 mucosal flaps,4 lateral nasal wall flaps,5 free flaps,13 and radial forearm flap14; and autografts using temporal fascia,9 allograft dermal matrix,15 septal cartilage,16 conchal cartilage,17 tragal cartilage,18 and iliac crest.6 In one study, the success rate for small perforations (<1 cm) was 92%, and the success rate for large perforations (>2 cm) was 25% in primary perforations.7 Reperforations are still a major problem following surgery, especially for larger perforations. Reasons for such reperforations are unclear. Treatment of reperforations is more difficult because of fibrosis and the loss of tissue. However, the main determinant of success in reperforation repair surgery, apart from surgeon skill and experience, is the selection of a suitable surgical method for the patient.19 Another important predictor of successful surgery is the size and location of the perforation. The vertical height of the perforation is more critical than the anteroposterior dimension because the approximation of the mucoperichondrial edges from the floor of the nose to the dorsum causes the greatest tension.20 It is also important to determine the cause of the nasal septal perforation before surgery. Nasal surgery and digital trauma are the main causes of perforations. However, vasculitis, neoplasms, and granulomatous diseases may cause perforations and reperforations. Surgical success is decreased in the presence of systemic disease.

A suitable surgical approach is the main predictor of success. The size and location of nasal septal perforations are major determinants of the surgical approach and technique used. The absence of residue cartilage and bone and perforations that are large vertically decrease the success rate. Both open and closed surgical approaches using different intranasal mucosal flaps and interpositional grafts have been described for the surgical repair, with differing success rates.10,21

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Sex/Age, y</th>
<th>Preoperative Symptoms</th>
<th>Location</th>
<th>Vertical Size of Perforation, mm</th>
<th>Follow-up, mo</th>
<th>Outcome</th>
<th>Postoperative Symptoms</th>
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<tr>
<td>1</td>
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<td>Asym</td>
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<td>F/26</td>
<td>C, NO, E</td>
<td>Co</td>
<td>23.0</td>
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<td>Incomplete closure</td>
<td>Asym</td>
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<td>Co</td>
<td>26.2</td>
<td>9</td>
<td>Closed</td>
<td>Sym</td>
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<tr>
<td>4</td>
<td>M/28</td>
<td>C, NO, E, BO</td>
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<td>28</td>
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<tr>
<td>5</td>
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<td>Co</td>
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<td>Asym</td>
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<tr>
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<td>25.7</td>
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<td>F/39</td>
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<td>Asym</td>
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<tr>
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<td>Co</td>
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<tr>
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<td>M/45</td>
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<td>Co</td>
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<tr>
<td>17</td>
<td>M/42</td>
<td>C, NO, E, B</td>
<td>Co</td>
<td>21.6</td>
<td>15</td>
<td>Closed</td>
<td>Asym</td>
</tr>
</tbody>
</table>

Abbreviations: A, anterior perforation; Asym, asymptomatic; BO, bad odor; C, crusting; Co, combined perforation; D, dryness; E, epistaxis; F, female; M, male; NO, nasal obstruction; P, posterior perforation; Sym, symptomatic; W, whistling.
closed technique, although there is no external scarring and an earlier healing process, visualization is inadequate, and there are some difficulties in suturing mucosal flaps. In contrast, the open approach, first described by Kridel et al., had the advantage of perfect visualization and easier manipulation. The external approach is required for a superior and posterior perforation because it enables wide surgical visualization and increased ability to maneuver. Locally advanced flaps are not suitable for larger or posterior perforations. In these cases, inferior turbinate flaps are used and better surgical results are obtained because of their high vascularity, wide range of rotation, and wide volume. In addition, using several mucoperichondrial mucosal flaps and interpositional grafts in both approaches plays a role in the migration and regeneration of tissue and improves surgical success. The necessity and advantages of an interpositional graft between mucosal flaps have been described thoroughly; they serve as a barrier between the flaps to prevent incisional breakdown. Another advantage of the interpositional graft is that it acts as a scaffold for tissue migration and regeneration, decreasing the risk of r-perforation. For interpositional graft material, auricular conchal cartilage is readily obtained and sufficiently large and biocompatible with septum, which is why we prefer auricular cartilage to enable the migration of mucosa to fill the cartilage and bone defect completely.

However, the literature contains no results on the use of auricular cartilage and bilateral mucosal flaps in the external approach, especially in revision cases. In addition, with the bilateral mucoperichondrial flaps approach, the interpositional graft is completely covered by the flaps. Ours are the first objectively reported results for surgery in revision patients. All of the patients in our series had previous nasal surgery and larger perforations, both of which decrease the success rate. Our prior experience has demonstrated that in the closure of larger perforations, it is very effective to use bilateral mucosal flaps combined with interpositional bilateral auricular cartilage grafts to repair perforations, even in revision cases. With our mucoperichondrial flap technique, the healing process is perfect because of the high vascularity of the mucosa of the inferior turbinate. The base of the flap in the floor of the nose and the caudal part of the septum received sufficient blood from the surrounding mucosa to survive. It is well known that as the vertical height of the nasal septal perforation increases, surgical closure becomes more difficult. In our technique, however, manipulation is easier because of the external approach, and sufficient tissue is obtained from the nasal floor and the inferior turbinate mucosa. Consequently, with the external approach, the flap remains free of strain, with no tension.

The main disadvantages of our technique are the risk of the enlargement of the perforation during bilateral flap elevation, the much longer operating time, the lengthened healing period due to the bilateral flap elevation, and the external scar.

Conclusions

We used a successful multilayer closure technique with good exposure in patients with reperforation. Although the external approach is time-consuming and results in an external scar, it also has a very high success rate, even for larger, posteriorly located perforations.

Author Contributions

Umit Taskin, corresponding author, study design, data collection, analysis of data, acquisition of data; Ozgur Yigit, data collection, study supervision, acquisition of data; Sezim A. Sisman, data collection, administrative, technical, and material support.

Disclosures

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