


Endoscopic Endonasal Repair of Septal Perforation with Interpositional Auricular Cartilage Grafting via a Mucosal Regeneration Technique

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Abstract

We evaluated the efficacy of interpositional auricular cartilage grafting for perforation with an endoscopic endonasal approach via a mucosal regeneration technique. In total, 12 patients with symptomatic septal perforations were operated on by way of an endoscopic endonasal approach after an adequately sized cartilage graft was harvested. The graft was inserted between the circumferentially incised and elevated flaps of the perforation and secured by vertical and horizontal nonabsorbable aligning approximation stitches and prolonged placement of silicone splints. The average perforation size was 12.3 mm (range, 4–19 mm). Bleeding, incrustation, pain, whistling respiration, and nasal congestion symptoms were relieved entirely in 10 of 12 patients (83.3%) who had successful treatment. This study showed that an endoscopic endonasal approach via a mucosal regeneration technique without direct mucosa-to-mucosa repair can be applied successfully without disrupting the neighboring nasal structures for septal perforations up to 20 mm and as effectively as other, more complex surgical interventions.

Keywords

auricular cartilage, endoscopy, endonasal approach, nasal septal perforations

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Multiple methods of septal perforation repair have been described in the literature, often involving complex flaps, grafts, and approaches. Closure through the mucosal regeneration technique via an external rhinoplasty approach and auricular cartilage has been described.^{1,2} We present a technique that has been further simplified with an endoscopic endonasal approach, making repair less complex.

In this study, a simplified surgical technique borrowed from otologic surgery was presented. We used an endoscopic endonasal

approach with a cartilage graft for anteriorly located small- and medium-sized perforations.

Patients and Methods

This was a retrospective study approved by the Ethical Board for Clinical Research at Bezmialem Vakif University (March 31, 2016; decision 7/36). Twelve patients were included, who were all identified with septum perforations on examination (**Table 1, Figure 1A**). Follow-up visits were carried out regularly at 1, 3, and 6 months postoperatively. Total closure with no residual perforation was considered a successful result (**Figure 1B**). The perforations were symptomatic, <20 mm in size, and located in the anterior region. Chronic granulomatous diseases, systemic diseases (eg, uncontrolled hypertension and diabetes), heavy smoking, chemical addiction, and exposure to heavy metal/acid fumes were criteria for exclusion.

Surgical Technique

An endoscopic endonasal approach under general anesthesia was the preferred method for each patient. The nasal mucosa was decongested with nasal packing soaked with 1:10,000 adrenaline diluted in 5 mL of saline solution. An interpositional cartilage graft, 5 to 6 mm larger than the septal perforation size, was harvested from the triangular fossa of the auricle, its perichondrium preserved on both sides via an anterior approach.

Infiltration was carried out generously to the septum surrounding the perforation site with a mixture of 2% lidocaine hydrochloride and 1:100,000 adrenaline (**Figure 2A**). The perforation edges were trimmed to obtain fresh margins for the perforations <10 mm in diameter. Incision and elevation in the cephalic half of the perforation were performed

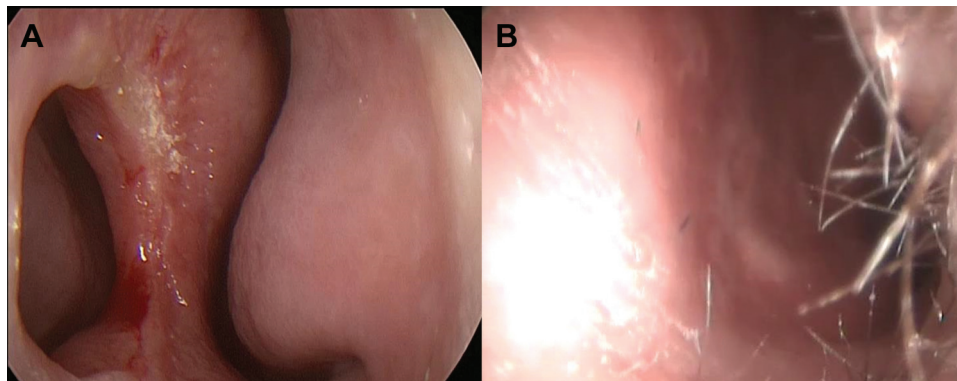
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Table 1. Preoperative Characteristic of Patients.

Patient	Age, y	Cause of Perforation	Perforation Size, mm	Comorbidities	Previous Surgical Repair Attempts	Follow-up, mo	Outcome
1	27	Previous septoplasty	4	None	Primary	12	Successful closure
2	28	Previous septoplasty	15	None	Primary	20	Successful closure
3	27	Previous septoplasty	13	Former smoker	Primary	23	Failure
4	34	Trauma	12	None	Primary	28	Successful closure
5	23	Previous septoplasty	7	None	Primary	22	Successful closure
6	17	Previous septoplasty	11	None	Primary	20	Successful closure
7	28	Previous septoplasty	16	None	Primary	24	Successful closure
8	31	Trauma and -previous septoplasty	19	None	Primary	26	Successful closure
9	33	Previous septoplasty	17	Former smoker	Primary	22	Failure
10	31	Previous septoplasty	12	None	Primary	28	Successful closure
11	28	Previous septoplasty	11	None	Primary	53	Successful closure
12	32	Previous septoplasty	10	None	Primary	22	Successful closure
Mean ± SD	28.2 ± 4.6		12.3 ± 4.2			25 ± 4.2	

**Figure 1.** Preoperative view (A) and postoperative view (B).

directly through the nares while the septal mucosa was tight (**Figure 2B, C**). Then, a modified Killian's incision was carried out 4 to 5 mm caudal of the septal perforation (**Figure 2D**). The submucoperichondrial level was reached, and the flaps in caudal half of the perforation were elevated (**Figure 2E**). The flaps in the cephalic half of the perforation were combined with the part elevated caudally through the modified Killian's incision with a sharp dissection. A circumferentially mucosal pocket (depth: 3–4 mm) was carefully prepared, avoiding lacerations to all perforation edges (**Figure 2F**). An adequately sized cartilage graft was inserted between the mucoperichondrial flaps and into the mucosal pocket without closure of the mucosal edges (**Figure 2G, H**). The interpositioned cartilage graft was secured by vertical- and horizontal-aligning 5/0 polypropylene stitches with a tapered needle (**Figure 2I**). Doyle splints were left in place for 3 to 4 weeks. Systemic antibiotics were prescribed postoperatively for 1 week. A surgical video is available (see video 1 at www.otojournal.org/supplemental).

Results

We reviewed 12 cases operated on for symptomatic nasal septal perforations (largest diameter <20 mm) at our department between January 2012 and March 2015. The patients (8 males and 4 females) had a mean age of 28.2 years (range, 17–34 years). The average perforation size was 12.3 mm (range, 4–19 mm). The average duration of the operation was 54 minutes. The follow-up time ranged from 12 to 53 months, with a mean of 25 months. Complete closure was achieved in 10 (83.3%) patients and partial closure in 2 (16.7%). No reperforation occurred in the successfully repaired perforations during the follow-up period.

Discussion

The closure of septal perforations remains a surgical challenge. The main surgical approaches reported are the endonasal and external rhinoplasty approaches.³ In an external rhinoplasty, there are advantages, such as excellent visualization of the

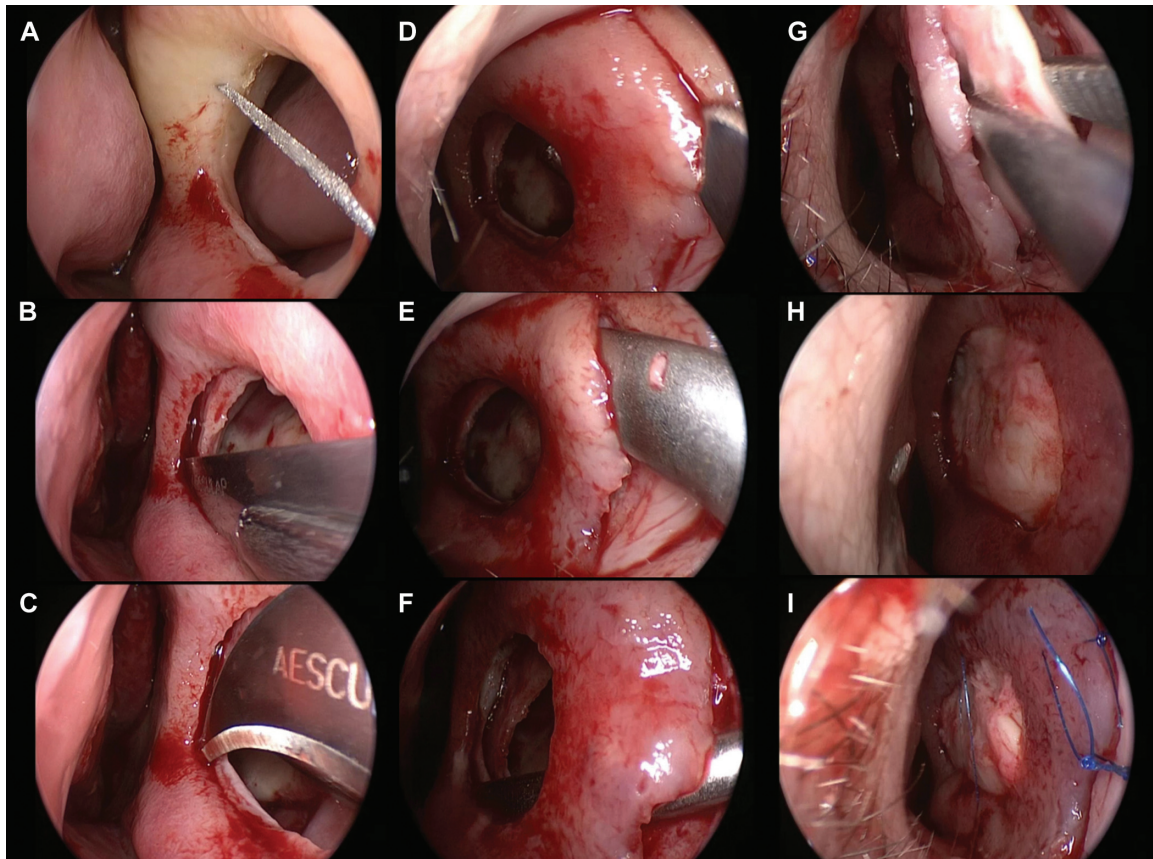


Figure 2. Infiltration (A). Incision and elevation of perforation edge (B, C). Modified Killian's incision and elevation of caudal flap (D, E) to generate mucosal pocket (F), which was inserted with cartilage (G, H). Fixation with polypropylene stitches (I).

septal perforation in all directions, better visualization of the nasal cavity, binocular viewing of the nasal septum, and the opportunity for the surgeon to use both hands. Disadvantages include the lengthy operation time, columellar incision scar, postoperative scar contracture, and tip ptosis.¹

The endonasal approach has several advantages, such as no external scarring, minimal tissue destruction, low bleeding risk, and minimal damage to anatomic integrity. Disadvantages of the endonasal approach include inadequate visualization, 1-handed intervention, and limited space for surgical manipulations.⁴

With our technique, the septal perforation repair is analogous to the epithelialization process of a perforated tympanic membrane repaired through cartilage myringoplasty techniques. Incorporation of the cartilage graft gives support and facilitates healing via the scaffolding. Mucosal healing over the perichondrium-cartilage layer is an expected development, as it was shown that even mostly denuded septal mucosa can heal within weeks following harvesting of a pedicled nasoseptal flap in expanded endonasal operations.⁵

Preserving intact perichondrium on both sides provides nutrients to the cartilage and renders it resistant to resorption. An autogenous interpositional cartilage graft provides strong support against reperforation and facilitates mucosal healing. We are able to replicate the surgical success

obtained in the external approach by using an interpositional cartilage graft via an endoscopic approach.

Conclusions

Our technique has the advantages of a shorter operation time, minimal scarring of the skin, and minimal damage to mucosal coverage of the internal nose. This is the first reported study in which only a cartilage graft with its perichondrium on both sides was harvested and used as an interpositional cartilage graft by way of an endonasal approach under endoscopic view in small- and medium-sized septal perforation repairs.

Author Contributions

Orhan Ozturan, drafting, final approval, analysis of the data, agreement of the work; **Alper Yenigun**, data analysis, drafting, accountability of work, final approval of the version to be published; **Erol Senturk**, data analysis, drafting, final approval, agreement of the work; **Sabri Baki Eren**, data analysis, drafting, final approval, agreement of the work; **Fadlullah Aksoy**, data analysis, drafting, final approval, agreement of the work.

Disclosures

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