

Closure of nasal septal perforations using bilateral intranasal advancement/rotation flaps

İki taraflı burun içi ilerletme/rotasyon flepleri kullanarak nazal septal perforasyon kapama

Ali Özdek, MD,¹ Ömer Bayır, MD,² Yusuf Dünder, MD,³ Emel Çadallı Tatar, MD,² Güleser Saylam, MD,² Mehmet Hakan Korkmaz, MD.⁴

¹Department of Otolaryngology, Medical Faculty of Karabük University, Karabük, Turkey

²Department of Otolaryngology, Dışkapı Yıldırım Beyazıt Training and Research Hospital, Ankara, Turkey

³Department of Otolaryngology, İdil State Hospital, Şırnak, Turkey

⁴Department of Otolaryngology, Medical Faculty of Yıldırım Beyazıt University, Ankara, Turkey

Objectives: This study aims to report our experience on surgical repair of nasal septal perforations (NSP) using bilateral intranasal advancement/rotation flaps with open septoplasty technique.

Patients and Methods: Medical records of 28 consecutive patients who were operated for NSP in our clinic between January 2009 and February 2013 were retrospectively analyzed. Demographic features of the patients and surgical results were evaluated.

Results: The most common cause of NSP was previous septal surgery in 18 (64%) of the patients. Nasal crusting was the most common symptom in 21 patients (75%). Perforation size ranged from 10 to 30 mm in diameter. Septoplasty was performed in five patients, while septorhinoplasty was performed in three patients simultaneously to the NSP repair. Nasal septal cartilage and auricular chonchal cartilage were used to support the nasoseptal skeleton, if required. There were no major intra- or postoperative complications. The mean postoperative follow-up period was 23 months. During follow-up, there was mild columellar retraction in five patients (18%). Nasal septal perforation was closed successfully in 24 patients (86%). Pinpoint perforation remained in two patients and perforation size was smaller than 5 mm in two patients.

Conclusion: Closing the NSP with bilateral intranasal advancement/rotation flaps has a comparable high success rate. Therefore, this technique can be easily applied to small-medium sized septal perforations.

Keywords: Nasal septum; nasal septum perforation; reconstructive surgical procedure; surgical flap.

Amaç: Bu çalışmada açık teknik septoplasti yoluyla iki taraflı burun içi ilerletme/rotasyon flepleri kullanılarak uygulanan nazal septal perforasyon (NSP) onarımındaki deneyimimiz sunuldu.

Hastalar ve Yöntemler: Ocak 2009 - Şubat 2013 tarihleri arasında kliniğimizde NSP nedeniyle ameliyat edilen 28 ardışık hastanın tıbbi kayıtları retrospektif olarak incelendi. Hastaların demografik özellikleri ve cerrahi bulguları değerlendirildi.

Bulgular: Nazal septal perforasyonun en sık nedeni 18 hastada (%64) daha önce geçirilmiş nazal septum cerrahisi idi. En sık görülen semptom 21 hastada (%75) burun içerisinde kabuklanma idi. Perforasyon çapı 10-30 mm arasında değişmekteydi. Nazal septal perforasyon tamiri ile birlikte aynı zamanda beş hastada septoplasti, üç hastada septorinoplasti uygulandı. Nazoseptal iskeleti desteklemek amacı ile gerekli olduğu durumlarda nazal septal kartilaj ve aurikula konkal kartilaj kullanıldı. Ameliyat sırası ya da sonrası majör komplikasyon ile karşılaşılma. Ameliyat sonrası ortalama takip süresi 23 ay idi. Takip sürecinde beş hastada (%18) kolumellar retraksiyon görüldü. Nazal septal perforasyon 24 hastada (%86) başarı ile kapatıldı. Pinpoint perforasyon iki hastada görülürken, iki hastada perforasyon 5 mm'nin altında idi.

Sonuç: İki taraflı burun içi ilerletme/rotasyon flepleri kullanılarak uygulanan NSP kapama kıyaslanabilir düzeyde yüksek başarı oranına sahiptir. Bu nedenle, bu teknik özellikle küçük ve orta çaplı perforasyonlara kolaylıkla uygulanabilir.

Anahtar Sözcükler: Nazal septum; nazal septum perforasyonu; rekonstrüktif cerrahi işlem; cerrahi flep.



Nasal septum perforation (NSP) is a structural defect that is commonly seen in the anterior part of the nasal septum as a result of necrosis of the cartilage and/or bony nasal septum and their mucosa.^[1] Although even nose picking, nose piercing, trauma, neoplasms, inhaled irritants, infectious and inflammatory diseases (especially granulomatous disease) can cause NSP, previous nasal surgeries (including septoplasty, submucosal resection, septorhinoplasty, transsphenoidal hypophysectomy) are the most common reasons for NSP. Nasal septum perforation can result in recurrent nasal bleeding, nasal dryness, nasal obstruction, pain, discharge, respiratory whistling and consequentially, great patient discomfort.^[2-4]

Surgical closure of NSP is not an easy procedure. Limiting factors that make the surgical repair difficult include presence of insufficient mucosa, structural abnormalities, and inappropriate systemic conditions of the patients.^[5] The majority of symptomatic NSPs require surgery, but there is no standard surgical approach in NSP closure, which still remains a surgical challenge.^[6] Various surgical techniques have been described for the surgical repair of NSP including open technique septoplasty, endonasal, sublabial and midfacial degloving approaches depending on the size of NSP. Different types of flaps have been designed to reconstruct the nasal septum. Most commonly used flaps are: inferior turbinate advancement flap (unilateral or bilateral), upper lateral cartilage inner mucoperichondrial flap, middle turbinate flap, facial artery musculomucosal pedicled flap, oral mucosal flap and also radial forearm free flap.^[7] Recently, some graft materials have been used for interposition between the mucosal flaps to support the NSP closure such as titanium membrane, biphasic calcium phosphate, acellular human allograft conchal cartilage, septal bone, acellular dermal graft, uncinat process, deep temporal fascia and fascia lata graft with high density porous polyethylene.^[6,8-13]

The purpose of this study is to report our experience with surgical repair of NSP.

PATIENTS AND METHODS

Twenty-nine patients who had surgical repair of nasal septal perforation by open septoplasty and bilateral rotation-advancement flaps between January 2009 and February 2013 were evaluated. One patient was excluded from the study due to interruption of planned surgery. Therefore

28 patients (12 males, 16 females; mean age 37 years; range 19 to 57 years) were included in the study.

All surgical procedures were performed by the senior author under standard endotracheal general anesthesia in supine position with head tilted up 30 degrees. The nose and septum were infiltrated with 1/100,000 epinephrine. A classical external rhinoplasty approach was performed. Bilateral marginal rim incisions were connected with midcolumellar inverted V incision. The columellar skin was dissected from medial and lateral crura and then skin was elevated in suprapericondrial and subperiosteal avascular plane in the dorsum of the nose. Then, sharp dissection was carried between two medial crura until the caudal edge of the nasal septum. Bilateral mucoperichondrial and mucoperiosteal flaps were elevated from the septum and extended through the septal perforation. If septal deformities were present; they were corrected at this stage. Flap elevations were continued bilaterally through the nasal floor and lateral nasal wall until reaching the attachment of the inferior turbinate. At this time a releasing incision was performed along the most lateral part of the flaps. Then anterior edges of the flaps were cut and posteriorly-based rotation flaps were created bilaterally. Thereafter two upper lateral cartilages were separated from the dorsum of the septal cartilage extramucosally. Septal mucoperichondrial flap elevations were continued approximately 1 cm through the internal face of the upper lateral cartilages and a releasing incision was performed bilaterally to create bipedicled advancement flaps. Then rotation and advancement flaps were approximated to close the perforation and sutured with absorbable sutures without any tension. If it was available, septal cartilage or auricular conchal cartilage were placed in the perforation site prior to closure; otherwise no additional grafts were placed. Newly created septal mucosa planes were approximated to each other by continuous mattress sutures with 4/0 vicryl. The external rhinoplasty incision was closed with 5/0 nylon in a routine manner. Silastic splints were placed in both nasal cavities to prevent synechia formation. These splints were left in place for five days. Light nasal packing was performed and removed after the first postoperative day. Figure 1 shows the schematic representation of the surgical technique. Figure 2 shows the surgical steps intraoperatively.

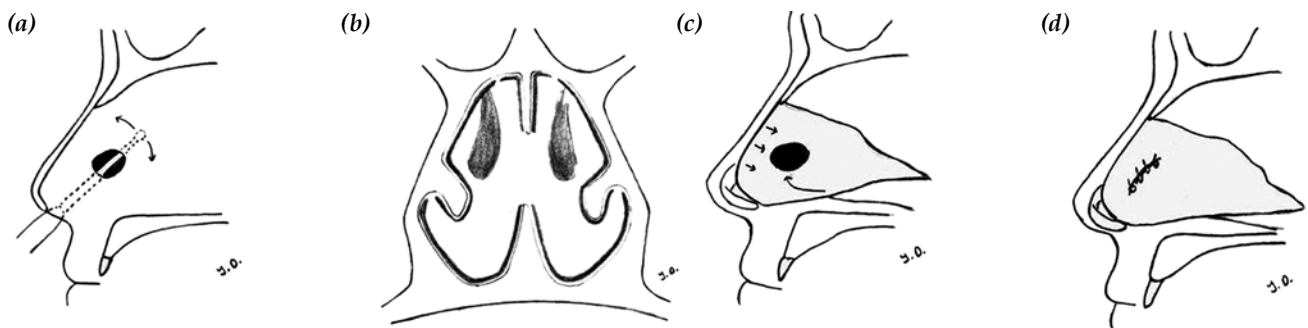


Figure 1. Schematic representations of surgical technique. (a) Elevation of the submucoperichondrial and subperiosteal flaps. (b) bilateral elevations of nasal floor and roof mucosa, (c) creation of bilateral rotation and advancement flaps (d) Suturing of the flaps and closing of perforation.

RESULTS

Perforation size ranged from 10 mm to 30 mm with a mean size of 20 mm. Perforation size was bigger than 15 mm in 16 patients. All patients were followed up by the senior author. The mean postoperative follow-up period was 23 months with a range of 5-50 months. The cause of the septal perforation was previous septal surgery in 18 patients (64%). There was no obvious etiology in the remaining patients. Nasal crusting was the most common symptom. Twenty-one patients (75%) had nasal crusting, 14 patients (54%) had nasal obstruction and nine patients (35%) had intermittent nasal hemorrhage. Septoplasty was performed in five patients and septorhinoplasty was performed in three patients at the same time as the septal perforation repair. The perforation site was supported with nasal septal cartilage in 11 patients. Auricular conchal cartilage was used in three patients to reconstruct the nasal dorsum.

The septal perforation was closed successfully in 24 of 28 patients (86%). A pinpoint perforation remained in two patients and perforations smaller than 5 mm persisted in another two patients. There was no surgical failure in patients where septal cartilage was placed in the perforation site. All four surgical failures were present in patients in whom no tissue supply was placed in the perforation site. However the statistical difference was not significant between the two groups (chi-square, $p=0.08$). Two of four surgical failure patients had septal perforations smaller than 1.5 cm, and two had septal perforations bigger than 1.5 cm. There was no statistically significant difference between the two groups (chi-square, $p=0.88$). Endoscopic nasal examinations at the eighth postoperative week showed that donor

sites were completely healed with epithelization in all patients. We did not observe blunting of the nasal valve area in any patient during endoscopic examinations. There were no major complications either intraoperatively or postoperatively. However, there was mild columellar retraction in five patients (18%). No additional surgery was required to repair columellar retraction in these patients.

DISCUSSION

Nasal septal perforations may cause aesthetic and functional problems. The common aesthetic problems are columellar retractions and nose saddling due to necrosis of the structural support of the nose.^[3] Additionally, chronic nasal obstruction and mucus stagnation due to damage of mucociliary activity lead to functional problems.^[12] While whistling may be seen in small perforations due to turbulence of airflow through the perforation, dryness and bleeding may also be determined in large perforations.^[14] Therefore, surgery should be included in the treatment not only to close the perforations, but also to restore or protect normal anatomical structures and physiological functions.^[3,12]

Many successful studies have been reported over decades using intranasal mucosal or mucoperichondrial flaps.^[1-5,7,8] Different success rates have been described in literature with those for bilateral intranasal flaps better than those for unilateral intranasal flaps especially when combined with autogenous connective tissue graft and open septoplasty technique.^[15] Although most authors claimed that their techniques have a high success rate and effective surgical solution, each surgical technique has its own drawbacks and advantages.

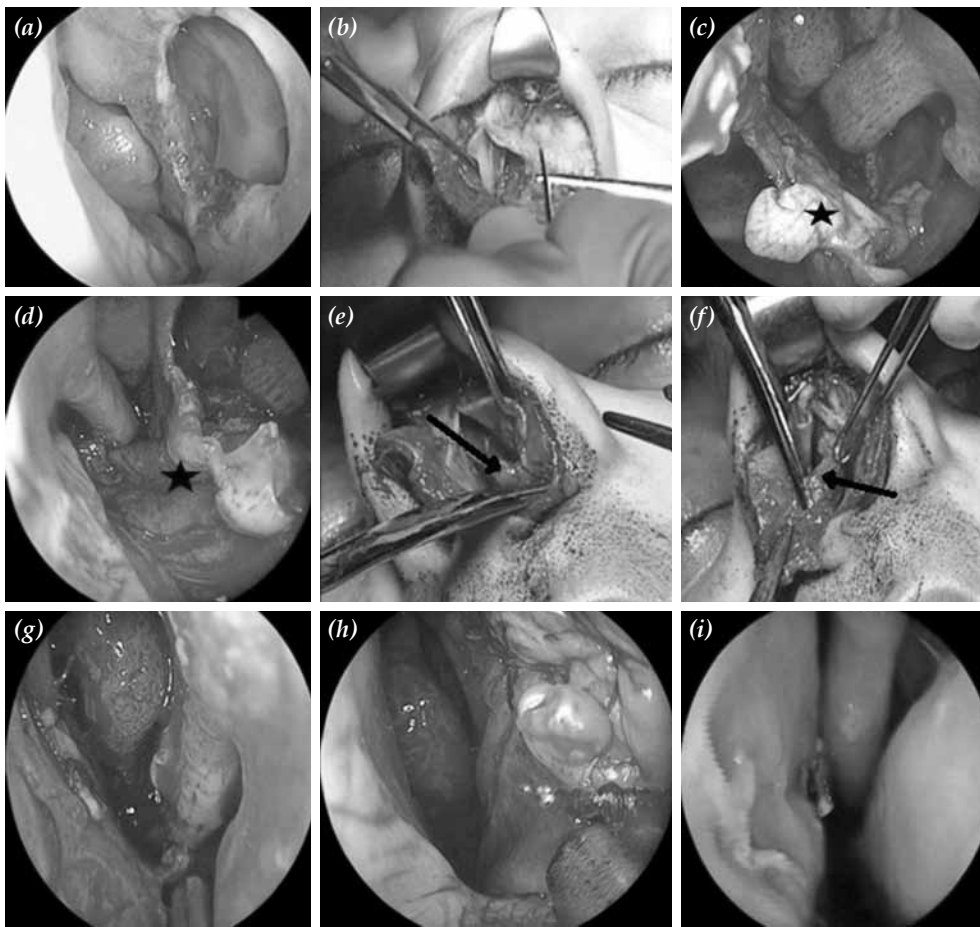


Figure 2. Surgical steps of nasal septum perforation repair. (a) Endoscopic view of nasal septum perforation, (b) classic external septoplasty approach was performed to reach caudal septum, (c) creation of nasal floor rotation flap (black star) on the left side, (d) creation of nasal floor rotation flap (black star) on the right side, (e) creation of nasal roof advancement flap (black arrow) on the left side, (f) creation of nasal roof advancement flap (black arrow) on the right side, (g) suturing of two flaps to close the perforation on left side, (h) suturing of two flaps to close the perforation on right side, (i) postoperative second week appearance of nasal septum perforation closure.

Romo et al.^[5] reported a total closure rate of 92.9% in their study by using open septoplasty technique with posteriorly based mucosal flaps. Foda^[15] used bipediced intranasal mucosal advancement flaps with connective tissue interposition grafts on 20 patient by using external rhinoplasty approach. He also used mucoperichondrium of the undersurface of the upper lateral cartilage for the large perforations and he reported a total closure rate of 90%. Woolford and Jones^[16] used unilateral inferior turbinate flaps with composite cartilage flaps with open septoplasty technique on 11 patients. However they only succeeded in closing the perforation in eight patients. Newton et al.^[17] used unilaterally bipediced septal mucoperichondrial

flaps with temporal fascia (if there was not enough septal bone) for 11 patients and their total closure rate was 92%.

André et al.^[14] used one side of the nasal cavity for rotation-advancement flap derived from the septum, the nasal floor and lateral nasal wall. Bipediced flaps from the septum and nasal floor and/or from the superior septum and under-surface of the upper lateral cartilage were created for the other side of the nasal cavity and they combined this technique with autogenous grafts using external approach. Their total closure rate was 93% and they concluded that this technique may not be adequate for very large perforations and is not necessary for smaller

perforations.^[14] Ribeiro and da Silva^[3] emphasized bilateral intranasal submucoperichondrial and submucoperiosteal advancement flaps with a sandwich graft interposition (deep temporal fascia with septal cartilage or ear cartilage) with closed rhinoplasty approach on 258 patients and they achieved successful closure in 255 (99%) of these 258 patients. Another technique has been reported by Friedman et al.^[18] They used inferior turbinate for the closure of the NSP and their total closure rate was 70%. Like the above mentioned, the best success rates were achieved in the techniques that use bilateral mucosal rotation-advancement flaps, especially using connective tissue graft.

External rhinoplasty or open septoplasty technique can provide a wide exposure for large and posteriorly located perforations. Additionally this approach can offer fixation of external nasal deformities and help in performing surgical maneuvers that are hardly ever possible with intranasal approach. Also, the open septoplasty technique allows work easily to create the nasal mucosal flaps bilaterally and gives a far better chance for total closure of the NSP.^[1,4,10,13,15,19]

The technique presented herein for the surgical closure of nasal septal perforations, combines several components of previously described techniques, and uses recognized surgical principles. Although this technique is not always necessary for smaller ones, it is our procedure of choice. We applied our surgical technique to all sizes of NSPs to standardize our technique. In our opinion, the most critical point during the NSP repair is the tension free approximation of intranasal mucosal flaps and suturing with a watertight manner. It is possible to achieve this goal with less traumatic techniques in small perforations. Tasca and Compadretti^[20] used superior bipediced flap in one side and inferior meatal flap in other side to repair NSP. They reported 94% closure rate in small perforations (<1 cm) and 75% closure rate in medium size perforations (1-2 cm). Although there was no large perforation in this group, there was a great success rate difference even between small and medium size perforations. Because, as the perforation size increases we need to mobilize flaps more extensively to approximate them in a tension free manner. Therefore, creating of a rotation flap gives more mobility for the approximation of the designed flaps.

We have achieved 86% closure rate for the any size of NSP. The main disadvantage of our technique seems to be the occurrence of mild columellar retraction. However, this situation took place only in five of 28 patients (18%) and no additional surgery was required in these patients. Less traumatic techniques such as use of advancement of mucosal flap inferiorly on one side and superiorly on other side can avoid this unwanted columellar retraction occurrence. We supported perforation site with septal cartilage in 11 patients. We achieved to close perforations in all of them. But we couldn't close perforations in four of remaining 17 patients. Although there was no statistical difference between two groups, absence of the supporting cartilage tissue can be a causative factor for the surgical failure.

Nasal septum surgery is one of the most commonly performed otorhinolaryngological surgeries in all over the world and NSP is one of the most important complications of nasal surgery. However, surgery of NSP closure is still a particularly challenging, time-consuming and fearsome procedure for ENT surgeons. Open septoplasty technique by using bilateral intranasal rotation-advancement flaps can be a good alternative for surgical repair of NSPs. However, less traumatic techniques can be preferred in small size perforations. Our technique has a comparably high success rate without major surgical complications. It has the advantage of local tissue usage and it doesn't require special training. Every ENT surgeon who is experienced with open septoplasty technique can perform this technique.

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