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A Novel Technique For The Repair Of Nasal Septal Perforation: A Bipediculated Crescent-Shaped Septal Flap

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Abstract

Objective: Nasal septum perforation is an anatomical defect located in the nasal septal cartilage/bone and mucosa. The most common cause of nasal septal perforations is septoplasty. Repair of nasal septal perforations is difficult regardless of the surgical technique due to its location and health of the surrounding tissues. Currently, no technique has been defined to be used for closure of all nasal septal perforations. We aimed to present our bipediculated crescent-shaped unilateral slide flap technique, which we designed and used as a novel technique for closure of nasal septal perforations, and its surgical results. Design: Retrospective study. Settings: Single-center patients with nasal septum perforation. Participants: 36 patients who underwent nasal septum perforation repair in our clinic between 2018-2022. All patients underwent surgical procedure with the same technique by the same surgeon. Main Outcome Measures: Nasal septum perforation closure success at 6th month follow-up. Results: Thirty-six patients, including 20 males and 16 females, were included in the study. The mean age of the patients was 35,58±9,6. The most common cause of nasal septal perforation was previous septal surgeries. The septal perforation dimensions of the patients were between 5-23 mm and the mean was 13,86±5,4 mm. Septal perforation closure rate was determined as 94.4% in the 6 months follow-up results after surgery. Conclusion: Bipediculated crescent shaped unilateral sliding flap is an effective, easy and novel technique in the repair of nasal septal perforations.

1.INTRODUCTION

Nasal septal perforation (NSP) may be defined as a defect occurring in the cartilage and/or bone of the nasal septum, causing the passage of air between the two nasal cavities. The prevalence of NSP ranges between 0.9% and 2.5%[1]. Although iatrogenic factors are the most frequent cause of NSP, it can also be encountered with intranasal drug dependence and inflammatory or infective pathologies. The most common iatrogenic causes of NSP include nasal septal surgeries, mucosal cauterizations, and long-term nasal tampon application.

While NSP is asymptomatic in the majority of cases, it can also manifest with varying clinical symptoms depending on the location and size of the perforation. The most common such symptoms include epistaxis, respiratory difficulty, a whistling sound, and nasal incrustation.

Surgical treatment of NSP remains a troubling and difficult procedure for rhinological surgeons. No effective and simple technique has to date been described for all perforations. Several methods, such as unilateral sliding flaps, bilateral sliding flaps, interposition grafts, and nasal button application have therefore been investigated in the literature. These methods all have their own advantages and disadvantages. Surgical success rates using these methods are in the region of 90%, the location and size of the septal perforation being the most important factor affecting the selection of the surgical technique and its success. Small and posterior perforations can be closed more easily than larger and anterior ones. In bilateral repositioned flaps, difficulties may be experienced in suturing the inferior-based flaps while pulling upward. In interposition grafts, nasal obstruction can be arisen because of the mass effect and the establishment of a secondary

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surgery field is another disadvantage. Also, in flaps in which upper lateral cartilage mucosa are used, dorsal anomalies can be occurred that may require revision surgery[2]. Posterior pedicle flaps created by an incision superior to the perforation have previously been described[3].

This study presents a bipediculated crescent-shaped unilateral sliding flap technique, designed and used by us as a novel modification for NSP repair, and its surgical outcomes. The advantage of our surgical technique is that a second, anterior-based pedicle is created by extending the incision in a crescent shape in an anterior direction, thus enhancing flap mobilization and stabilization. To the best of our knowledge, this technique has not been previously described in the literature.

2.MATERIAL-METHOD

Following receipt of approval from the "Blinded for review" Medical Faculty clinical research ethical committee (no. 2021/0970), the medical records of 36 patients, 20 men and 16 women, on whom we performed septal perforation repair between 2018 and 2022 were examined retrospectively. The IDEAL reporting guideline was followed in this study[4]. The patients' demographic characteristics, perforation size and etiology, and closure results were extracted and recorded. Informed consent was obtained from all patients.

The perforation dimension was determined by measuring the widest transverse diameter using a 0-degree rigid endoscope and ruler. Perforation diameters wider than 20 mm were regarded as large, those 10-20 mm in size as average, and those smaller than 10 mm as small. Patients followed-up for less than six months were excluded from the study.

2.1. Surgical Technique

All operations were performed under general anesthesia by the same surgeon (A.S.), with the patient in a supine position. Surgery was performed using a 0 degree rigid endoscope and a head lamp. Tampons impregnated with 0.1% xylometazoline hydrochloride were inserted into both nasal cavities and left for 10 min in order to improve visibility. Submucosal infiltration of 1% lidocaine with 1:100,000 epinephrine was applied in order to reduce bleeding and facilitate elevation. The septal cartilage was accessed with a left Killian incision from the anterior part of the perforation. If no septal cartilage support was present in the anterior part, both septal mucoperichondria were carefully separated from one another with a Freer elevator, thus accessing the anterior margin of the perforation. In this technique, the septal mucoperichondrium superior to the perforation region is elevated backward at least 0.5 cm from the posterior margin of the perforation. The septal mucoperichondrium in the inferior part of the perforation is then carefully elevated as far as the surgical margin in the superior direction. Granulation tissues and mucosa covering the perforation margins are carefully dissected with the help of a scalpel and removed. The edges of the perforation are straightened using thin, sharp forceps and scissors. The flap incision is extended beyond the level of the posterior margin in a crescent shape, starting at the same level as the anterior border of the perforation or more anteriorly, over the area of the perforation, wider than the height of the perforation (Figure 1-A) The most critical stage of the operation is the separation of the bilateral mucoperichondria. It is important to be prepared for interposition grafts in case of damage to the mucoperichondrium at this stage. The crescent-shaped mucosal flap described here is largely supplied by the superior labial artery in the anterior pedicle and posteriorly by the branches of the sphenopalatine and posterior ethmoidal arteries. The resulting bipediculated flap is easily displaced downward under the effect of gravity, the flap tension is quite low, and it covers the perforation region in a unilateral manner. In septal perforations, a sufficiently large flap can generally be obtained from the distance between the septal roof and the superior part of the perforation. Complete posterior-anterior flap stabilization is achieved due to the pedicle in the anterior and posterior. One point requiring care is that, in the light of flap contraction, the flap to be established must be larger than the height of the perforation. The mucosal flap covering the perforation is sutured in a trans-septal manner with 4.0 vicryl (Figure 1-B). Closure of the perforation is checked from both sides using a 0-degree rigid endoscope. The septoplasty incision is then closed with 4.0 vicryl. A Doyle splint is installed in both nasal cavities, to be removed after 14 days, and attached with 2.0 silk sutures. When the splints are removed and during subsequent controls, a gradually moving mucosal layer can be seen on the opposite side of the mucosal flap. The operative stages

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and postoperative images are shown in Figure 2.

3.RESULTS

Thirty-six patients aged between 19 and 55 years (35,58±9,6), 20 men and 16 women, were included in the study. The causes of perforation were previous septal surgery in 30 patients (83.3%) and history of trauma in six (16.7%). The most common presenting nasal symptoms were incrustation (80.5%), followed by epistaxis (68.3%) obstruction (63.8%), and whistling on inspiration (35.5%). Perforations ranged between 5 mm and 23 mm in size. Perforations were small in 10 patients (27.8%), average size in 21 (58.3%), and large in 5 (13.9%). The mean perforation diameter was 13,86±5,4 mm. (Table 1). Complete closure of the perforations as a result of the operations was observed in 34 of the 36 patients at 6^{th} month checks (94.4%). Defects up to 2 mm in the posterior perforation persisted in the other two patients. Since both patients were asymptomatic, no revision surgery was planned.

4.DISCUSSION

The study findings revealed a successful rate of closure of NSPs with our surgical technique. NSPs can lead to various nasal symptoms. Non-surgical therapeutic options are available for overcoming these symptoms in patients who refuse surgery or who are unsuited, such as nasal washing solutions, moisturizer sprays, and nasal septal button application. However, the only means of entirely and permanently eliminating symptoms is surgery. Several different techniques have been described for surgical repair. Surgical success rates are closely linked to the experience of the surgeon and to the size and site of the NSP. Success rates range between 78% and 93%, depending on the size of the perforation[5].

The techniques employed for the repair of NSPs have increased considerably in recent decades. Middle concha and lateral nasal wall posterior pediculated flaps are an appropriate choice for posteriorly located perforations. However, since access to the columnella is difficult, they are not suitable for anteriorly located perforations[6]. Lower concha flaps can be successfully employed in the closure of large perforations. However, nasal obstructions associated with excess tissue can be observed in this flap technique. In addition, secondary operations for severing the pedicle are required in these flap techniques[7]. Although nasal floor flaps are an appropriate option for inferior perforations, they are not suitable for superiorly located perforations[1]. Reperforation rates are lower in operations in which the perforation is closed using bilateral and interposition graft techniques, although the Swell body problem necessitating a second operation may be encountered[8]. Pericranial flaps are used in the closure of very large perforations. However, morbidity rates are high in this technique, and it is disadvantageous in terms of nasal functions due to the absence of nasal ciliary activity[9].

All these surgical techniques have their own advantages and disadvantages. A broad surgical perspective is therefore essential for the repair of NSPs with different characteristics. The closure of NSPs is easier with our technique. The most important advantages of this technique are ease of application and the fact that it does not require secondary operations. The crescent-shaped incision made over the perforation in this technique allows the flap to move freely under the effect of gravity, thus facilitating suturing. Moreover, it allows a larger flap to be obtained in larger perforations by extending the incision in a posterior direction.

The principal disadvantage of our technique is that it cannot be employed in perforations located in close proximity to the nasal roof and that extending to the membranous nasal septum, since it will not be possible to create the flap described.

5.CONCLUSION

There is no single technique for the closure of all NSPs. The closure of NSPs therefore still poses a significant difficulty for surgeons. It is important for each case to be evaluated separately when selecting the surgical technique. However, the novel technique described in this article is a simple procedure yielding successful results in NSP cases.

6. CONFLICT OF INTEREST

All authors declare that there is no conflict of interest.

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8.FIGURE LEGENDS

Figure 1 : Schematic design of the operative stages.**A-** Flap incisions **B-** View of the flap after suturing

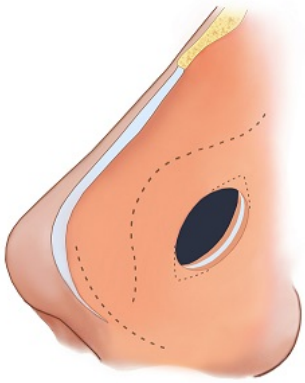
Figure 2: Surgical images of the operative stages. **A-**Preoperative view of the septal perforation from the right nasal cavity**B-** View of the left nasal cavity. Flap covering the perforation after incisions. #: The created flap. *: The right mucoperichondrium**C-** Appearance of the sutured flap from the left nasal cavity**D** - Image from the left nasal cavity on postoperative day 45

9.TABLES

Table 1: Demographic properties of patients

Age	Gender	Etiology	Class of Perforation Size	Diameter of Perforation (mm)	Result
32	Female	Septoplasty	Small	5,00	Successful
44	Male	Septoplasty	Small	7,00	Successful
23	Male	Septoplasty	Medium	12,00	Successful
35	Male	Septoplasty	Small	5,00	Successful
31	Male	Septoplasty	Medium	15,00	Successful
43	Female	Trauma	Medium	15,00	Successful
46	Male	Septoplasty	Medium	18,00	Successful
24	Male	Trauma	Large	23,00	Successful
37	Female	Septoplasty	Medium	15,00	Successful
55	Male	Septoplasty	Medium	12,00	Successful
27	Female	Trauma	Medium	20,00	Successful
36	Female	Septoplasty	Medium	18,00	2 mm perforation
32	Male	Septoplasty	Medium	15,00	Successful
40	Female	Septoplasty	Large	22,00	2 mm perforation
34	Female	Septoplasty	Medium	17,00	Successful

Age	Gender	Etiology	Class of Perforation Size	Diameter of Perforation (mm)	Result
25	Female	Trauma	Small	5,00	Successful
35	Male	Septoplasty	Medium	18,00	Successful
37	Male	Septoplasty	Large	22,00	Successful
42	Female	Septoplasty	Medium	12,00	Successful
24	Female	Septoplasty	Medium	15,00	Successful
19	Male	Septoplasty	Medium	15,00	Successful
27	Male	Septoplasty	Medium	17,00	Successful
52	Female	Septoplasty	Small	8,00	Successful
36	Male	Septoplasty	Medium	19,00	Successful
50	Female	Septoplasty	Small	7,00	Successful
26	Male	Septoplasty	Medium	14,00	Successful
32	Female	Septoplasty	Large	22,00	Successful
46	Female	Septoplasty	Medium	17,00	Successful
24	Male	Septoplasty	Small	8,00	Successful
51	Male	Trauma	Medium	13,00	Successful
48	Female	Septoplasty	Small	9,00	Successful
35	Male	Septoplasty	Large	21,00	Successful
22	Female	Septoplasty	Medium	15,00	Successful
40	Male	Trauma	Medium	11,00	Successful
27	Male	Septoplasty	Small	7,00	Successful
44	Male	Septoplasty	Small	5,00	Successful



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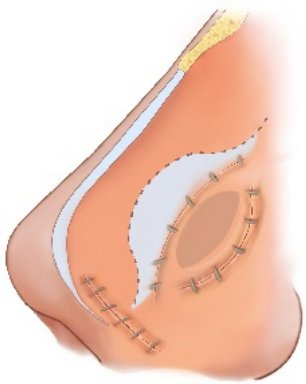

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