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Inferior Turbinate Flap Combined with Septal Cartilage Interpositional Graft for Repair of Nasal Septal Perforation

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The present study evaluated the use of inferior turbinate flap as an alternative technique for small to medium sized caudal septal perforations. Many techniques are available for surgical repair of nasal septal perforations. The availability of more than one technique emphasis that no single technique is uniformly suitable for all perforations. In this study, the inferior turbinate flap in addition to interpositional cartilage graft may be a good option that can be helpful in selected cases of caudal septal perforations. Patients were selected from the Dar al Shifa Hospital, Kuwait, complaining of recurrent epistaxis, nasal crustation and nasal blockage with history of septal surgery. Seventeen patients have been treated with this technique between May 2005 and December 2007; patients followed-up for 6 months. Complete closure achieved in 10 (59%) patients, incomplete closure occurred in 7 (41%) patients with flap necrosis. The use of inferior turbinate flap with interpositional cartilage graft for repair of septal perforation is a good option for repair of small to medium sized caudal septal perforations.

Key words: Septal perforation, iatrogenic, surgical repair

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INTRODUCTION

Nasal septal perforations are frequent nasal disorder. Anterior and wide septal perforations are more symptomatic, Small perforations refer to those with a diameter of 0.5 cm; medium perforations with a diameter ranging between 0.5-2 cm; large perforations with a diameter >2 cm (Romo *et al*., 1999; Meyer, 1992).

The otolaryngologist has to identify the causes, which, in most cases, are iatrogenic or idiopathic Perforations (Raman, 1990).

Many surgical techniques are available for surgical repair of nasal septal perforations. The variety of techniques is evidence that no single technique is recognized as being uniformly reliable in closing all perforations (Friedman *et al*., 2003).

Various flaps of local endonasal mucosa have been described in the literature. Knowledge of the vascular supply is paramount for success. Mucosal flaps may be taken from nearby healthy septum or from the inferior turbinate. tragal cartilage inferior turbinate mucoperiosteal sandwich graft technique have been also used (Hussain and Kay, 1992).

We have found some degree of success by using the inferior turbinate flap combined with cartilage interpositional graft as a treatment option for caudal septal perforations when advancement techniques are more difficult to be applied.

MATERIALS AND METHODS

Between May 2005 and December 2007, 17 patients were evaluated in the Dar al Shifa Hospital, Kuwait, complaining primarily from recurrent epistaxis, nasal crustation and nasal blockage with history of septal surgery.

Preoperative preparation: Preoperative evaluation and preparation is very important in the management of septal perforations.

More frequently, there is a significant crusting with discharge and lowgrade infection. The mucosa is friable, bleeds easily and is chronically inflamed.

A regimen of intensive nasal care and hygiene was started. The patient is instructed to irrigate his nose two or three times a day with sea water.

Use of nasal emollients may assist in lubricating the nose and lessening crusting. At some times, a course of antibiotic therapy is prescribed in conjunction with the irrigations. The patient is seen twice per week for suctioning and cleansing of his nose and the perforation. Once infection is eradicated and good hygiene established with control of crusting, a course of intranasal topical steroid spray assist in stabilizing the mucosa.

Surgery is undertaken only when the mucosa has stabilized and inflammation and crusting are under control.

Nasal septum was palpated in every case with a ring probe to asses the availability of any remaining septal cartilage to be used as an interpositional graft. If no septal cartilage available, conchal cartilage will be the alternative.

Surgical technique: This technique is limited to repair of caudal septal perforations of size ranging from 0.5-1.5 cm in diameter.

The flap depends on a normal or large inferior turbinate. Previously operated turbinates or patients with atrophic rhinitis are not candidates for this procedure (Friedman *et al*., 2003).

Unilateral flaps were done for all patients. The surgical technique proposed for closure of septal perforations has the following three elements:

All tissues are infiltrated with a solution with epinephrine (1:100,000) for homeostasis, including the columella and caudal end of the nasal septum.

- Septoplasty with trimming of septal perforation and obtaining septal cartilage as a graft if possible. If no cartilage available, conchal cartilage is taken. The dimensions of the cartilage graft must be considerably larger than the perforation, because the graft must have a larger diameter so its edges sit beyond the edges of the original perforation (Fig. 1)
- Stabilization of cartilage graft. Mattress sutures go through both mucosal flaps and the graft were taken in order to prevent migration of the graft, to hold the graft in apposition to the flaps as an aid in healing and to prevent postoperative bleeding or hematoma formation (Fig. 2)

Fig. 1: Trimming of anterior septal perforation

Fig. 2: Interpositional cartilage in place

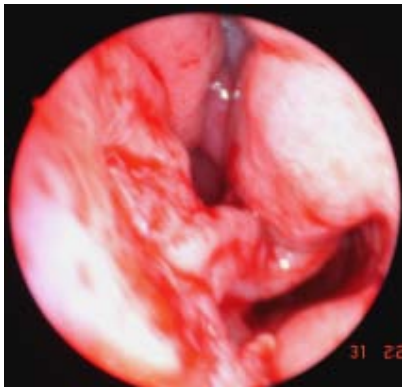

Fig. 3: Inferior turbinate flap raised

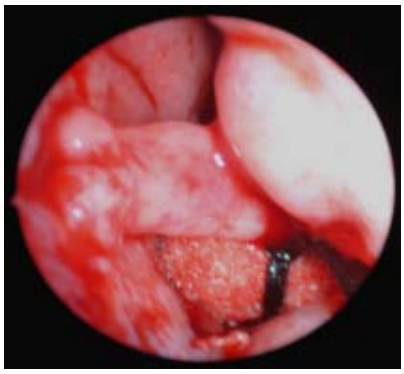

Fig. 4: Flap sutured in place with nasal pack

- Creation of the inferior turbinate flap (Fig. 3). The inferior turbinate flap is sutured to the edges of the perforation. Nasal pack inserted behind the flap (Fig. 4)

Removal of nasal pack done in the operating theater. Cutting of the flap done 3 weeks after the 1st operation.

Table 1: Septal perforation classification according to size

Size	No. of patients (%)
Small (<0.5 cm)	6 (35)
Medium (>0.5-1.5 cm)	11 (65)
Large (2 cm)	0

Table 2: Septal perforation symptoms

Symptoms	No. of patients (%)
Crusting rhinitis	11 (65)
Epistaxis	5 (23.5)
Whistle	3 (18)
Nasal obstruction	7 (41)

Table 3: Cases classified according to techniques used

Techniques	No. of patients (%)
Interposition graft	1 (5.5)
Interposition graft with inferior turbinate flap	16 (94.5)
2nd operation with release incision	1 (5.5)

Table 4: Results classified according to original perforation size

Size	Complete closure (%)	Subtotal closure (%)	Failure (%)
Small (<0.5 cm)	6 (35%)		
Medium (0.5-2 cm)	3 (17.6%)	2 (11.7%)	6 (35%)
Large (>2 cm)	0	0	0

Table 5: Results classified according to surgical technique used

Technique	No. patients	Complete closure (%)	Subtotal closure (%)	Failure (%)
1	1 (5.5%)	1 (5.5%)		
2	16 (94.5%)	8 (53%)	2 (11.7%)	6 (35%)
3	1 (5.5%)	1 (5.5%)		

1: Interposition graft, 2: Interposition graft with inferior turbinate flap, 3: 2nd operation with release incision

RESULTS

Seventeen patients have been treated with this technique between May 2005 and December 2007. Follow-up was for 6 months. They were 14 (82%) male and 3 (18%) females. The mean age was 30.6 (age range between 26 and 41 years). All patients underwent septal surgery before. These perforations varied in diameter from 0.5-1.5 cm (Table 1), all were caudal perforations. Table 2 show symptoms of septal perforation in different patients. Techniques used listed in Table 3. Nine have had complete closure of their perforations. Two other patients had incomplete closure with a residual perforation. In one of those patients, the residual perforation size allows release incision in the anterior and inferior part of the nasal septum to be done. The septal mucosa posterior to the release incision is dissected until the anterior edge of the perforation and the mucosa is advanced in posterior direction to be approximated to the posterior edge of the perforation and the perforation completely closed after. So complete closure achieved in 10 (59%) patients. Inferior turbinate flap necrosis occurred in the remaining 6 patients after 1 week. So failures have been occurred in 7 (41%) patients (Table 4, 5). No other complications were noted. As expected, all of the patients complained of

unilateral nasal airway obstruction for the 3 weeks between stages of the operations.

In all cases, septal cartilage was sufficient and there was no need to harvest conchal cartilage.

DISCUSSION

Nasal septal perforations differ widely in cause or origin, size, location and symptomology. Symptomology is essential in determining whether a perforation should be repaired or not. Most perforations go unnoticed by the patient and therefore need not be repaired. However, some perforations cause significant symptoms of bleeding, crusting and whistling. Although iatrogenic perforations secondary to nasal septal surgery are the most common cause, trauma, cauterization, cocaine use, vasculitis and idiopathic and other causes have all been implicated. The neighboring cartilage and mucosa may be normal or variably diseased depending on the cause of the perforation. The decision to repair a perforation and what tissues to use certainly are influenced by the health of the local tissues that will be used in the repair. Clearly, the ideal repair would resurface the septum with respiratory mucosa of nasal origin (Friedman *et al*., 2003).

Connective tissue autografts are used commonly to interpose between the repaired septal flaps. Commonly used materials are temporalis fascia and pericranium, both of which require a separate donor site. Pericranium, fascia and temporalis are extremely thin grafts with very low metabolic requirements that act as templates for overlying mucosal tissue migration and vascularization. Additionally, the graft maintains a barrier between the corresponding repaired flaps during the healing process and decreases any risk of incisional breakdown and reperforation (Woolford and Jones, 2001).

Size is a crucial factor as well in determining the wisdom of proceeding with surgical repair, in determining the type of repair and in predicting success of repair. Small perforations are generally treated with local advancement flaps from the remaining septum with an underlying connecting tissue autograft. Huge, near-total perforations cannot be repaired with local tissue (Friedman *et al*., 2003; Fairbanks, 1980).

Several Techniques using temporal parietal-fascia flaps, other regional flaps and external septorhinoplasty approach have been described for repair of these large perforations (Kridel *et al*., 1986).

The location of the perforation is a key element in the decision to perform or not to perform repair and in the type of repair to use. Posterior perforations are harder to repair with advancement flaps but are less likely to cause symptoms. Caudal perforations are also more difficult to repair with advancement flaps. The inferior turbinate flap is ideal for caudal perforations but equally suitable for perforations of the mid septum (Friedman *et al*., 2003).

In this study, complete closure achieved in 10 cases (59%) of cases using combination of interpositional graft with inferior turbinate flap. Additional closure achieved in a fifth case, where residual perforation remains after inferior turbinate flap, after release incision in the septal mucosa. Failure of repair occurred in the second case with release incision with complete failure of the repair. Flap necrosis occurred in 7 (41%) cases, followed by interpositional cartilage necrosis and complete failure of the repair.

Friedman *et al*. (2003), in their study using the inferior turbinate flap for repair of septal perforation, show that seven cases (87.5%) have had closure of their perforations. These perforations varied in vertical height from 1 to 2 cm. One patient, who had previous partial resection of the inferior turbinate, had flap necrosis with complete failure of the repair.

The key advantages of the inferior turbinate flap are abundant vascularity, wide rang of rotation, combined skeletal and epithelial support; it uses respiratory tract mucosa, which allows the repaired septum to achieve physiological normalcy. Other methods that use skin grafts or buccal mucosa grafts may be effective in closing the perforation but leave the patient with a dry nose that continues to crust because skin normally sheds and normal respiratory tract mucosa is not present (Woolford and Jones, 2001).

The major disadvantage is the requirement for a second-stage procedure for removal of nasal pack and to release the pedicle. Also the abundance of tissue that makes it a reliable flap is also a disadvantage because the flap may have enough bulk to cause partial obstruction of the airway. Assessment of the appropriate flap volume is important in preventing this complication.

Weerda (2001) described a technique that based on preservation of turbinate function by using only half of the turbinate. He has found success using the inferior turbinate as a composite flap as an option that may be helpful in selected cases.

The use of inferior turbinate flap is a useful technique for repair of iatrogenic small and medium perforations. It offers a valuable source of respiratory tract mucosa that may be healthy when septal mucosa had been previously damaged. The additional use of interpositional grafts adds a good support for the turbinate flap and the edges of the septal perforations. Perforations are more likely to relapse in an atrophic environment.

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