ABSTRACT

Background and Objectives: As septoplasty has been performed more often in recent years, the incidence of septal perforation as one of its complications has also increased. Authors aimed to elucidate the etiology and clinical characteristics of the septal perforation.

Materials and Methods: Fifty-eight patients with septal perforation were diagnosed between 1991 and 1998 at the Department of Otolaryngology, Asan Medical Center. Of them, 46 were male and 12 were female, and their ages ranged from 14 to 76 years of age (mean 47 years). Medical records were retrospectively reviewed to investigate the etiology, clinical symptoms, and treatment results.

Results: The most common cause of septal perforation was associated with nasal surgery (41 patients 72%) such as submucous resection (22 patients), septoplasty (10 patients), and transseptal pituitary tumor surgery (7 patients). Malignancy involving the nasal septum was the second common cause (8 patients 14%). Nasal stuffiness was the most common complaint (36 patients 62%), followed by crust formation (24 patients 41%), and nasal bleeding (7 patients 12%). Around three quarters of patients had perforation smaller than 10 mm in diameter and the cartilaginous septum was the most common site of perforation (88%). Eleven patients not responding to medical treatment underwent surgical repair with a success rate of 91%. Conclusions: This study shows that most of the septal perforations are caused by previous nasal surgery involving the nasal septum. Surgeons should be very careful not to make a bilateral corresponding mucosal tear during the septal surgery. If this occurs, meticulous suture-repair with interposition of graft should be applied. For the chronic symptomatic perforation that is refractory to medical treatment, surgical repair using flap and grafts could be performed with a success rate of 90%.

KEY WORDS: Septal perforation · Etiology · Surgical repair.

INTRODUCTION

Nasal septal perforation causes change to the physiology of the nose. Congenital perforations are known to be very rare and most of them are caused by acquired factors such as iatrogenic one like surgery, traumas, infectious ones like syphilis or tuberculosis, and the toxicity by the heavy metal. Nasal septal perforation also can be caused by tight nasal packing for the epistaxis control and the habitual nosepicking. Metabolic diseases such as diabetes also may cause nasal septal perforation due to poor blood supply. Acute infections such as nasal septal abscess can also be the cause.

When the lamellar flow of normal inspiration turns into turbulent flow due to nasal septal perforation, the nasal mucosa is damaged from dryness and then generates excessive crusts, which will eventually cause nasal obstruction, recurrent epistaxis, and eventually exposing the nasal septal cartilage. In addition to these, nasal septal perforation may also cause rhinolalia aperta, headache, and deformity of the external nose.

Nasal septal perforations are mostly discovered incidentally because most patients have no specific symptoms. Many various surgical methods for perforations can be used when conservative management fails to relieve symptoms. It requires highly sophisticated surgical techniques and its results also vary among surgeons. In this study, we aimed to know the clinical characteristics of the nasal septal perforation, focusing on etiologic factors, and the treatment results according to the surgical methods.
MATERIALS AND METHODS

Fifty-eight patients who were diagnosed with nasal septal perforation and treated at the Department of Otorhinolaryngology, Asan Medical Center, Seoul, between 1991 and 1998 were collected. Male were 46 and female were 12 with an average age of 47 years old, and ranging from 14 to 76 years of age. Through a retrospective study of medical records including operation records, causes of nasal septal perforation, its clinical symptoms in accordance with location and size of perforations, and results of treatment were closely examined.

RESULTS

The most common cause of septal perforation was associated with nasal surgery in 41 cases (72%). Classifying the 41 cases by the surgery type, submucous resection (SMR) 22 cases was the most common cause followed by septoplasty 10 cases, transseptal pituitary tumor surgery 7 cases, and septal tumor excision 2 cases.

All of the 22 SMR cases had the surgery at other hospitals and the 10 septoplasty cases were operated at Asan Medical Center. During that period, we conducted 1,352 cases of septoplasty, so the incidence of perforation was 0.74% (10 perforations/1,352 cases). Reviewing the operation records of the 10 patients with septal perforation after septoplasty revealed that nine of them received the suture with 4-0 chromic catgut due to bilateral mucosal laceration near the vomer or the maxillary crest during submucoperichondrial dissection procedure. One of the patients had a history of receiving SMR and mucosal tear was developed during dissection procedure on the site where the cartilage has been removed before.

The second most common cause was the malignant diseases such as polymorphic reticulosis, and T cell lymphoma, which involved the nasal septum as found in 8 cases (14%). Finally, two cases were found in the platers dealing with chrome and zinc, and the causes of two other cases have not been identified (Table 1).

Their main complaints included nasal obstruction (36 cases, 62%), crust formation (24 cases, 41%), nasal bleeding (7 cases, 12%), and whistling on respiration (1 case, 2%). However, twenty-one patients (36%) did not complain of any symptoms.

The size of perforation ranged from 1mm to 35 mm in diameter. The small-sized perforation less than 5 mm were found most commonly in 32 cases, while medium size of 6-10 mm and large size of 11-20 mm were observed in 17 and 8 cases, respectively. A perforation larger than 20 mm was found in only one case. The smaller the size of the perforation, the more frequently the symptom of nasal obstruction was found, and more crust formation was found as the perforation size increases (Table 2).

The cartilaginous septum was the most common site of perforation with 51 cases (88%), there were 4 cases (7%) of perforation which were found in the bony part, and 3 cases (5%) of perforation occurred on the area crossing over the cartilaginous and bony part of the septum (Fig. 1).

Out of the 58 patients, 21 patients (36%) who had no symptoms were just under observation on their progress and the 26 patients (45%) were treated with conservative methods such as applying ointment (Terramycin® ophthalmic ointment, Pfizer Pharm, Seoul, Korea), and irrigation with normal saline.

The surgical repair was done for 11 patients who suffered from severe symptoms but had no response to

<table>
<thead>
<tr>
<th>Table 1. Causes of nasal septal perforation (N=58)</th>
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<tbody>
<tr>
<td>Nasal surgery</td>
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<tr>
<td>Submucous resection</td>
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<tr>
<td>Septoplasty</td>
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<td>Transseptal approach</td>
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<td>Excision of nasal tumor</td>
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<td>Malignancy</td>
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<td>Polymorphic reticulosis</td>
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<td>T cell Lymphoma</td>
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<td>Acute myelocytic leukemia</td>
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<td>Wegener’s granulomatosis</td>
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<td>Surface irritants</td>
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<td>Chrome</td>
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<td>Zinc</td>
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<td>Nasal trauma</td>
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<td>Electrocauty</td>
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<td>Idiopathic</td>
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<th>Table 2. Symptoms according to the size of the perforation</th>
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<td>Size (mm)</td>
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<tr>
<td>1-5 (n=32)</td>
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<tr>
<td>6-10 (n=17)</td>
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<tr>
<td>&gt;11 (n=9)</td>
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<td>Total (N=58)</td>
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the conservative management (Table 3). The bipedicled advancement mucoperichondrial flap (BAMF) was used for 9 patients with perforations which were smaller than 10 mm and were not positioned too anteriorly. The posteriorly based rotation flap (PBRF) was used for 2 patients with perforations which were larger than 10 mm or positioned at the anterior part of the nasal septum. One out of two cases which were treated with the PBRF procedure took the bilateral PBRF. One other case took the unilateral PBRF and the mucosal defect of the side was repaired by the method of Donal. In 10 cases, Tutoplast® (Biodynamics International GmbH, Germany), a commercialized temporalis muscle fascia of which immunity is removed through irradiation, was interpositioned between the two mucosal flaps. Autologous septal cartilage was used for interposition graft in one case. One case repaired with BAMF and Tutoplast® interposition showed reperforation, however, the remaining 10 cases (91%) were successfully cured.

**DISCUSSION**

Until the middle of the 20th century, infectious diseases such as tuberculosis, commonly involving cartilaginous part, or syphilis, chiefly involving bony part, have been the main causes of nasal septal perforation, but, with the development of industry, heavy metal, like chrome or zinc, once was the main cause. More recently, however, nasal septal surgery and trauma are reported as the most common cause of the perforation. Among the perforations due to nasal septal surgery, SMR and septoplasty were the most common causes. In this study, more than half of the perforations were caused by surgery for the deviated nasal septum. There was relatively high occurrence of perforation after the transseptal pituitary surgery, which can be explained by the fact that many cases of pituitary tumor surgery are performed in the authors’ hospital.

There is high occurrence rate of septal perforation, when the mucosal tear is made at both sides of corresponding area during nasal septal surgery. The result of this study also revealed bilateral mucosal tear, even in the cases sutured with 4.0 chromic catgut resulted in perforations. In such cases, the suture itself was very difficult and moreover, it was harder to put together the margin of the torn mucosa precisely. Thus, it may be helpful for the regeneration of torn mucosa to suture under endoscopic guide and to interpose a piece of fascia or cartilage between the torn mucosae. When perforations are small or located in posterior nasal septum, there is a minimum symptom in most of the cases. In case of perforations located in the cartilaginous part of anterior nasal septum, the symptoms such as crust formation, stuffy nose, whistling on respiration and epistaxis are commonly observed. Perforations occurring in the bony part of the septum usually show no symptoms. As the size of the perforation gets smaller, the increased number of nasal obstruction symptoms can be observed in this study. This can be explained by the fact that most of the perforations occurred in the anterior cartilaginous part of the septum. In many cases, patients begin to complain of symptoms, which they did not feel until doctors find the perforation incidentally and inform patients about it. Therefore, doctors should be careful in informing the perforation when the patients do not complain of any symptoms, especially when the perforation is caused by

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**Table 3. Treatment outcomes (N=58)**

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<th>Treatment</th>
<th>Number of patients</th>
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<tr>
<td>No treatment</td>
<td>21 (36%)</td>
</tr>
<tr>
<td>Medical treatment</td>
<td>26 (45%)</td>
</tr>
<tr>
<td>Surgical repair</td>
<td>11 (19%)</td>
</tr>
<tr>
<td>Advancement flap with Interposition of fascia</td>
<td>8*</td>
</tr>
<tr>
<td>Interposition of septal cartilage</td>
<td>1</td>
</tr>
<tr>
<td>Posteriorly based rotation flap</td>
<td></td>
</tr>
<tr>
<td>Bilateral flap and fascia interposition</td>
<td>1</td>
</tr>
<tr>
<td>With evagination of marginal mucosa</td>
<td>1</td>
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</tbody>
</table>

*In one out of 8 cases reperforation developed
iatrogenic reasons.

When the septal mucosa is severely damaged, it is transformed into transitional epithelium, which makes more susceptible to external stimuli and dryness resulting in bleeding, ulcer, infection, and ultimately perforation.1)

When there are no symptoms, or in case with minimum symptoms, there will be no need for the extensive treatment, and the conservative management should be attempted first in the cases with symptoms. Maintaining humidity by spraying or irrigating with normal saline, or inserting gauze strips or cotton balls impregnated with ointment into the nose for about three hours a day for 1-2 weeks will be an effective conservative method. By using cottontipped applicators, Vaseline® or Terramycin® ophthalmic ointment can be applied to the perforation.11)(12)

Non-surgical treatments are effective in case of an active granulomatous disease, vascular disease, and the patients with high operation risk. Non-surgical methods use artificial materials such as silicone obturator or silicone button, but many patients complain of foreign body sense.13)

There are two major surgical methods for the nasal septal perforation: one is the flap surgery using the adjacent mucosal flap and the other is transplanting composite graft. For the graft, septal cartilage, perpendicular plate of ethmoid bone, vomer, temporalis muscle fascia, pericranium, periosteum of the mastoid, mucosa of the maxillary sinus, pinna, and middle turbinate mucosa can be used.14-17) For the flap surgery, a method using septal mucoperichondrial flap by Fairbanks,5) Kridel, et al.,9) Goodman and Strelzow,12) is most widely applied. These methods can be applied to various sizes of perforations but is not recommended in cases with atrophic changes near the adjacent mucosa. In cases using this method for large perforations, chances of the reperforation is higher. When the perforation is relatively large (greater than 10 mm) and is located in the anterior area of the septum, an application of the posteriorly based flap is required because the perforation cannot be filled with the advancement flap. In that case, a fairly big flap can be obtained when the mucosa in the lateral wall of the inferior turbinate is included in the flap, depending on the perforation size. The surgical process can be difficult on elevating or suturing the flaps because operational view is limited. Surgical exposure can be improved through

distraction.4-7) Columellar flap,8) external rhinoplasty approach,10) and the endoscopic manipulation. Karlan,1-20) on the other hand, used the mucoperiosteal flap from the nasal floor, which can be also used for large perforations.

Generally, small perforation (smaller than 10 mm) or ones which are not located in the extremely anterior part, can be repaired with the bipedicled advancement mucoperichondrial flap. In case of large perforations (greater than 10 mm) or when they are positioned in the anterior part of the nasal septum, the posteriorly based unipedicled flap method is recommended. The suturing method7) which conducts circumferential incision and evagination of the flap to the opposite side is a relatively simple method, thus can be recommended as a substitute for flap surgery of one side.

**CONCLUSION**

The nasal septal perforation is mainly caused by the complication of the nasal septal surgery. Therefore, the perforation should be prevented by conducting meticulous suture and graft interposition when the bilateral corresponding mucosal tear has occurred.

Patients who do not respond to conservative management can be successfully managed using bipedicled advancement mucoperichondrial flap or posteriorly based rotation flap, depending on the size or location of their perforations.

**REFERENCES**


