



Repair of nasal septal perforations using auricular conchal cartilage graft in children: Report on three cases and literature review^{☆,☆☆}

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KEYWORDS

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Summary

Objectives: Repair of nasal septal perforation is a challenging procedure. Numerous methods have been described to close nasoseptal perforations with varying degrees of success. The lack of a consensus on nasoseptal perforation repair reflects the shortcomings of each method. There has been a paucity of literature on nasoseptal repair in the paediatric age group. We report our experience of repair of nasal septal perforation secondary to button battery injury using auricular conchal cartilage in the paediatric population.

Methods: Retrospective review of case notes and close regular follow-up of the patients since their first presentations with button batteries as foreign bodies in the nose.

Results: Three out of the three children who underwent repair of the nasal septum achieved successful closure of the nasal septum. One child with a large septal perforation required three procedures to achieve closure of the perforation.

Conclusions: Repair of nasal septal perforations is a challenging procedure especially in children. Good results can be achieved with auricular conchal cartilage graft.

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1. Introduction

The nasal septum is an important physiologic and supportive structure of the nose. Nasal septal perforation may give rise to either functional problems such as crusting, bleeding, whistling, pain, discharge and obstruction or cosmetic problems such as dorsal saddling or columellar retraction [1].

Various methods of surgical closure of the perforation have been described: advancement and suture of the perforation border [2], the use of an oral mucosal flap [3], temporalis fascia graft [4], conchal cartilage with perichondrium and mastoid periosteum [5], inferior turbinate flap [6], tragal cartilage with perichondrium and temporalis fascia [7], bone and temporalis fascia graft [8], acellular human dermal allograft [9] and two-stage expanded mucosal flaps [10] have been described. Despite the numerous techniques, there is no ideal surgery especially for larger perforations.

In the paediatric age group, repair of nasal septal perforation is even more challenging. This is especially so if the perforation occurs secondary to button battery burn injuries. The edges of the perforation tend to be scarred and the mucosa is usually thinner and irregular. Occasionally minor crusting persists and granulation tissues may be present. Exposure of the nasal septum is limited in small children and there is always the worry of affecting the growth and development of the nose during surgery. We report our experience in the repair of nasal septal perforation secondary to button battery injury in three children.

2. Materials and methods

Three patients with symptomatic nasal septal perforation from November 2000 to June 2004 were identified. All three patients sustained nasal septal perforation secondary to button battery injury and they complained of nasal crusting and nasal obstruction that did not resolve with at least 6 months of conservative management including regular nasal

douching. The surgical technique used to repair the nasal septal perforations is similar in all three cases and will be elaborated later in this paper.

3. Case reports

3.1. Patient 1

A 4-year old Malay girl presented to the Emergency Department with high fever, yellow rhinorrhoea, left maxillary sinus tenderness and left eye swelling for 3 days duration. There was no history of button battery insertion into the nose. Radiographs of the sinuses (Fig. 1) showed a disc-like foreign body with metallic intensity in the left nostril suggestive of a button battery. She was admitted and the button battery was removed urgently under general anesthesia on the day of admission. Intra-operatively, the button battery was lodged in the anterior nasal space. There was necrotic turbinate tissue in the left anterior nasal space and necrotic cartilage was obvious in the right side of the nasal septum. No perforation was evident at that time.

Two weeks later, extensive crusting was noted at the left anterior nasal space with exposed cartilage and necrotic tissue. There were also granulation tissues around left inferior turbinate and nasal septum. The right anterior nasal space was normal. Four-weeks later, a 0.8 cm diameter nasal septal perforation with extensive crusting was discovered (Fig. 2). She was treated with oral antibiotics and regular nasal douching. After 6 months of conservative management, the nasal septal perforation remained stable in size. She was then scheduled for an elective repair of the nasal septal perforation.

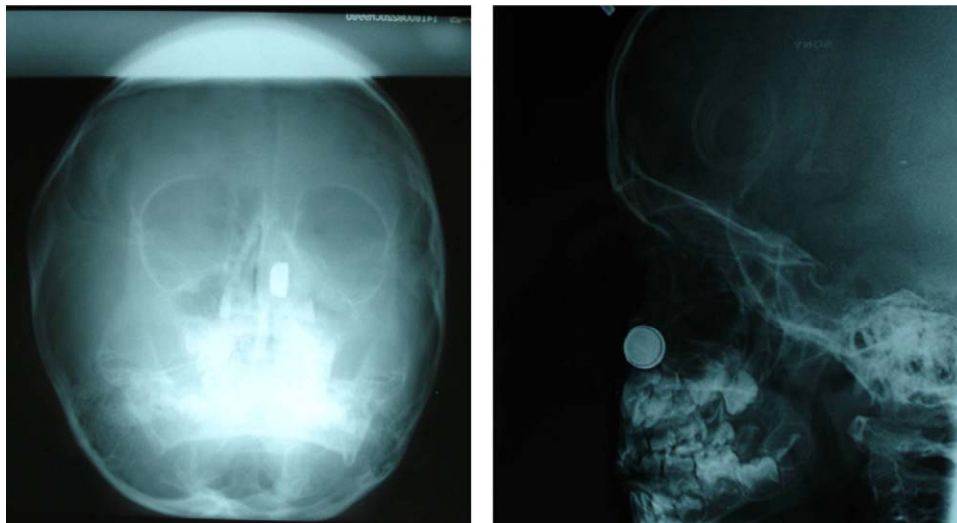


Fig. 1 Submental vertical and lateral view plain films showing a disc-like foreign body with metallic intensity in the left nostril suggestive of a button battery.

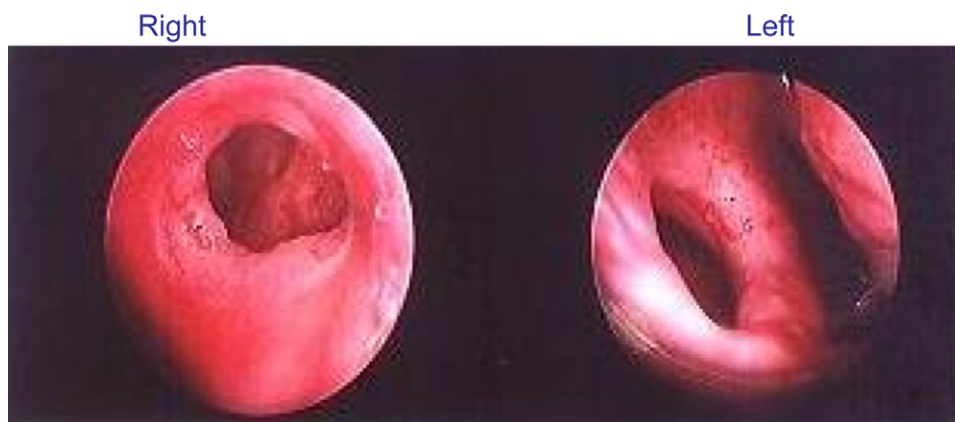


Fig. 2 Right and left endoscopic pictures showing a 0.8 cm diameter nasal septal perforation.

Intra-operatively, a 0.8 cm septal perforation was found on the nasal septum 1 cm posterior to the columella in the middle of the nasal septum. The edges of the perforation were clean. The surgical technique for repair is described below.

Post-operatively, the patient was well. Regular follow-ups revealed the auricular conchal cartilage graft was healthy and the septal perforation had fully healed and closed 5 weeks after operation. Follow-up 1 year later revealed the nasal septum to be healthy with no scarring.

3.2. Patient 2

A 4-year-old Chinese boy was witnessed putting a button battery into his left nostril. He was brought into the Emergency Department on the same day. Radiographs of the sinuses showed a disc-like metallic foreign body in the left nostril suggestive of a

button battery. He was admitted and the button battery was removed under general anesthesia on the day of admission. Intra-operatively, the button battery was found under the left inferior turbinate with extensive crusting. No perforation was noted.

Three weeks later, a 0.5 cm septal perforation was noted over the anterior-inferior part of the nasal septum. He was treated conservatively with antibiotics and regular nasal douching. Subsequent regular follow-ups showed that the perforation did not reduce in size. He was then scheduled for a nasal septal perforation repair using auricular conchal cartilage graft 6 months after the incident. Intra-operatively, a sequestrum was noted over the left inferior turbinate where the button battery was impacted. This was removed.

Post-operatively, the auricular conchal cartilage graft was healthy and the nasal septal perforation was fully healed 6 weeks after operation. Follow-up 1 year later revealed the nasal septum to be healthy with no scarring (Fig. 3).

Right nasal cavity

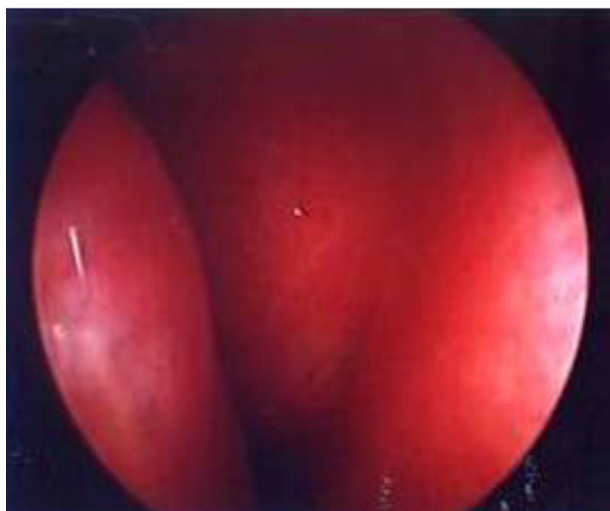


Fig. 3 Endoscopic picture showing healthy nasal septum with no scarring.

3.3. Patient 3

A 4-year-old Malay boy was witnessed putting a button battery into his right nostril 2 days prior to his consult at the Emergency Department. He presented with right sided epistaxis, fever, right maxillary tenderness and swelling. He was admitted and the button battery was removed under general anesthesia on the day of admission. During the operation, the mucosa in the right side of the nasal septum was eroded exposing the cartilage. No perforation was noted.

Two weeks later, a large central nasal septal perforation 1.2 cm diameter with extensive crusting and granulation tissue was noted in the right side of the nose. Adhesion was also evident over the superior part of the nasal septum and the lateral wall. An adhesiolysis was done. After 6 months of

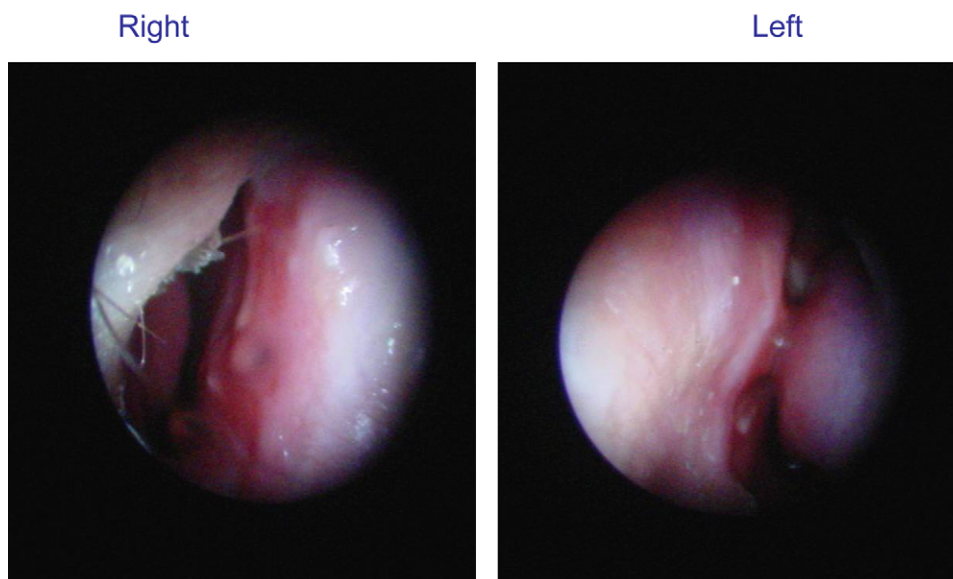


Fig. 4 Endoscopic picture showing good healing of the graft with successful closure of the perforation.

conservative treatment, there was still crusting of the nose. The nasal septal perforation was however stable in size. An elective repair of the nasal septal perforation was performed. Unfortunately after the first repair, there was graft failure. A second repair was performed for the patient 3 years after the 1st repair. During this intervening period, the patient was lost to follow-up. Unfortunately after the 2nd repair, there was partial graft failure. The size of the nasal septal perforation became smaller. A 3rd repair was done for the patient 6 months after the 2nd repair. Post-operatively after the 3rd repair, there was good healing of the graft with successful closure of the perforation (Fig. 4). Follow-up 1 year later after the 3rd repair revealed the nasal septum to be healthy with minimal scarring.

3.4. Surgical techniques

The surgery is performed under general anaesthesia. Nasal packing was done with 0.025% oxymetazoline soaked ribbon gauze to achieve nasal decongestion. The nasal septal mucoperichondrium is infiltrated with 2% lignocaine and 1:80,000 adrenaline. A conchal cartilage graft is harvested via a post-auricular incision. The cartilage is removed with intact perichondrium on both sides. The auricular wound is then hemostased and closed with 6/0 Monocryl. A modified Killian's incision is then made on the septum opposite to the button battery injury side. A mucoperichondrial flap is then raised around perforation to create a pocket large and deep enough to hold the graft in situ. Bilateral anterior nasal space merocel packing are placed after the repair. Flavine wool is placed over the natural

depression of the anterior surface of the pinna. Mastoid dressing is then applied for a week. The patients are nursed in high dependency ward post-operatively as they usually experienced uncomfortable nasal obstruction.

The packs are removed the following day and the patient discharged with 1-week course of oral antibiotic. Regular follow-ups are done to monitor healing around the nasal septal perforation.

4. Results

Three patients underwent surgical repair of nasal septal perforation using auricular conchal cartilage graft. They were followed up for between 1 and 3 years. Successful closure of nasal septal perforations occurred in all three patients. All three patients had complete relief of their pre-operative complaints of nasal crusting and obstruction.

5. Discussion

The incidence of nasal septal perforation is around 1% [12]. There are many causes of nasal septal perforation. In the adults, the vast majority are iatrogenic following nasal septal surgery [11]. There is a paucity of literature on the causes of nasal septal perforation in the pediatric age group. The authors believe that trauma may be a significant cause. Button batteries though relatively uncommon in some countries, are the commonest cause of nasal septal perforation in our institution. Once it occurs, it results in unhealthy edges of the perforation and

surrounding tissues. Surgical repair if necessary has to be postponed till the perforation edges and the surrounding tissue are clean and healthy.

In the paediatric age group, most surgeons also tend to be more hesitant in performing nasal septal repair as there is a fear of affecting the growth and development of the nose. Bejar et al. [13] studied 28 children who underwent external septoplasty for severe nasal obstruction caused by septal deviation anterior to the nasal spine. He found that external septoplasty does not affect most aspects of nasal and facial growth, but it may negatively influence growth of the nasal dorsum.

There are many methods of nasoseptal repair described in the literature. Various types of connective tissue autografts have been performed. The temporalis fascia graft has a low vascular requirement with a high success rate for perforations less than 4 cm in diameter. Fairbanks [4] achieved closure in 32 out of 35 patients using this method. The ethmoid or vomerine bone with iliac crest graft [20] or mastoid periosteum [21] are alternatives that are easy to suture in place and has a high success rate of more than 90%. Meyer [22] described a 3-step procedure that achieved closure in septal perforation larger than 4.5 cm in size. Hussain and Murphy [7] described a sandwich graft technique where the tragal cartilage is placed between the temporoparietal fascia and deep temporal fascia. This autograft has a low vascular requirement and he achieved closure in all 14 patients whose perforation was less than 4 cm.

Intranasal mucosal flaps such as the inferior turbinate flap have a limited success rate of 7 out of 10 patients as described by Friedman et al. [15]. The advantages are abundant vascularity of the flap, wide arc of rotation and relative ease of harvesting and insertion of the flap. The disadvantage is the requirement of a 2nd stage operation to release the pedicle. Also many patients complain of nasal obstruction post-operatively. A "cross-stealing" technique described by Mladina et al. [16] has a success rate of three out of four patients. This technique is based on two mucoperichondrial flaps (one from each side of the septum) that is used to close the perforation and is a simple procedure. Extranasal flaps such as the labial-buccal flap [17], pericranial flap [18] or radial forearm free flap [19] is uncommonly done for large septal perforation. These methods usually have significant donor site morbidity.

Interpositional grafts, mainly xenografts are alternatives described in the literature. These range from porcine small intestinal mucosa [23], acellular human dermal allografts [24] to bioactive glass [25].

Our method of repair using auricular conchal cartilage is advantageous as the conchal cartilage is easy to harvest with minimal donor site deformity and morbidity. It is also suitable for large nasal septal perforation in the paediatric population. The operation is reasonably easy to perform with good cosmesis. Raising the flap and creating the pocket for graft insertion may be difficult due to the small size of the patient, after a button battery burn scar or if it is a repeat procedure. No stitching is necessary as the graft is inserted into the pocket created. Careful merocel packing of both nostrils for 24–48 h is adequate for stabilization of the graft. After careful removal of the merocel packing, the fibrin of the normal healing process will continue to hold the graft in situ till it heals. The operation is done on the uninjured side after the granulation tissue has settled and the edges of perforation become healthy. The donor site scar is well hidden in the post-auricular area. The nasal septum usually heals with near normal appearance with cartilage in the centre and mucoperichondrial surfaces on both sides.

6. Prevention

Prevention is always better than treated nasal septal perforation caused by button batteries. Animal studies conducted by our department where a button battery is inserted into the nasal cavity of anaesthetized rabbits showed that full thickness necrosis of nasal septal cartilage occurs as short as 15 min (unpublished). Factors affecting the extent of tissue damage include the amount of potential in the battery, the orientation of the battery with respect to the mucosal surface and the length of time the battery was lodged in the nose. A clinical study on six children with button battery injury to the nose published by Loh et al. [14] showed that the shortest time to nasal septal perforation is 7 hours. They concluded that button batteries are harmful foreign bodies that should be removed urgently to minimize the likelihood of long-term complications like nasal septal perforation.

7. Conclusion

Repair of nasal septal perforations is a challenging procedure especially in children after button battery injury. Good results can be achieved with auricular conchal cartilage graft. It is an alternative in the armamentarium of methods used in nasal septal perforation repair. It gives good cosmetic and functional results and can be extended for use in other

causes of septal perforation. Good management includes urgent removal of lodged button batteries in children to prevent nasal septal perforation.

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