

Recurrence rate of repaired hard palate oronasal fistula with conchal cartilage graft

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Background: After cleft palate repair, oronasal fistula (ONF) formation is one of the considerable and troublesome complications. Conchal cartilage graft is one option that can be used in recurrent fistula correction. The aim of the current study is investigating the recurrence rate of the hard palate ONF or ONF at the junction of hard and soft palate after utilizing conchal cartilage graft and comparing this rate with other methods. **Materials and Methods:** In this observational prospective study, 29 patients suffering from ONF with small, medium and large sizes who were referring to Alzahra university hospital, Isfahan, Iran and Fateme Zahra university hospital, Tehran, Iran between November 2011 and November 2012 were enrolled. All patients had midline cleft palate, 29.6% of them had cleft lip too that was repaired previously. All patients were followed-up for 2 years (every 2 months) after repair. **Results:** The mean (range) age of studied samples was 10.7 (2-23) years. 16 patients (55.7%) were female, and reminders were male. During 2 years followup, we detected recurrence of ONF in 6 patients (20.68%) and the success rate was 79.32%. The recurrence rate, after applying the current approach, among who experienced the several times of recurrence was significantly higher than among those who experienced first time of recurrence (33.3% vs. 7.1%; $P < 0.001$). The mean [\pm SD] age of failed and successfully repaired patients were 11.3 (\pm 4.5) and 8.4 (\pm 5.25) years, respectively ($P > 0.1$). **Conclusion:** Using of conchal cartilage graft for recurrent ONF with ≤ 1 cm was safe and efficacious, in ONF > 1 cm conchal cartilage graft can be used as a primary method and if recurrence occurred chooses other complex procedure.

Key words: Cleft palate, conchal cartilage, oronasal fistula

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INTRODUCTION

After cleft palate repair, oronasal fistula (ONF) formation is one of the considerable and troublesome complications. According to previous studies the incidence of ONF are varies from 4% to 35%.^[1] Repair under tension, bleeding during the operation, postoperative infection, type of cleft palate and surgical technique are some of the fundamental risk factors that are involved in ONF formation.^[2] ONF can cause either clinical symptom such as nasal fluid and food regurgitation, hypernasal speech, malodor, hearing loss and nasal catarrh or psychosocial and behavioral disorder, affecting all aspects of patient's life.^[3] ONF can occur at any point along the line of repaired cleft, so depending on the location, they can be divided as follow: Anterior, midpalate, at the junction of soft and hard palate and soft palate.^[4] The junction of soft and hard palate at posterior and the junction of premaxilla and maxilla at anterior portion are the commonest site of ONF formation.^[5] Based on fistula sizes, they described as small (< 3 mm), medium (3-5 mm) and large (> 5 mm).^[6]

Fistula closure is one of the most rigorous challenges that surgeons encounter, so over the recent two decades, many surgical techniques such as utilizing tong flap,^[7,8] orbicularis orismusculomocosal flap,^[9,10] free flap,^[11] bucal mucosal graft^[12] or acellular dermal matrix^[13] have been introduced, however, recurrence fistula after primary repairment will occur with high probability.

Conchal cartilage graft is an option that can be used in recurrent fistula correction. In some previous studies, this graft have been evaluated in animal cleft palate^[14] or in human small cleft palate repairmen.^[15] Hence, our purpose in current study is investigating the recurrence rate of the hard palate ONF or ONF at the junction of hard and soft palate after utilizing conchal cartilage graft and comparing this rate with other methods.

MATERIALS AND METHODS

Study design and participants

In this prospective study, 29 patients suffering from ONF with small, medium and large sizes who were

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referring to Alzahra university hospital, affiliated to Isfahan University of Medical Sciences, Iran and Fateme Zahra university hospital, affiliated to Iran University of Medical Sciences, Iran, between November 2011 and November 2012 were enrolled. Patient's characteristics data such as age, sex, fistula sizes and the number of operation has already been recorded. The mean (range) age of studied samples was 10.7 (2-23) years. 16 patients (55.7%) were female, and reminders were male. All patients had midline cleft palate, 29.6% of them had cleft lip too that was repaired previously. No patient had alveolar cleft. For 14 patients first, for 10 patients second, for three patients third and two patients fourth times of recurrent were recorded. All patients were followed up for 2 years (every 2 month) after repairment.

Surgical technique

All surgical repairs were done under general endotracheal anesthesia supplemented with local anesthesia of 1% lidocaine in 1:100,000 epinephrine and a prophylactic dose of antibiotic as a first generation Cephalosporin (cefalotin 50 mg/kg/in child and 1g/IV in adult). The fistula was evaluated under general anesthesia and cannulated with a suitable curved metal probe to localize the defect and the limit of dissection and to evaluate approximately the size of the fistula [Figure 1]. The fistula was excised to separate the nasal from the oral mucosa at the plane of the palatal bone. Palatal mucoperiosteal flap was elevated starting at the apex of the gingival sulcus of each tooth and is dissected for 2-3 mm from the fistula margin, creating a pocket for the cartilage graft [Figure 2]. Nasal mucosal flap was elevated from palatal bone. Care must be exercised not to perforate the nasal thin mucosal posterior to the hard palate.

After closure of the nasal lining with 4/0 monocryl, conchal cartilage graft was harvested from the patient's ear through a postauricular incision [Figure 3] and was configured to fit the defect with about 10% excess all around [Figures 4 and 5].^[16]

The cartilage graft was fixed to the nasal mucosa with 4/0 monocryl sutures, then oral mucoperiosteal flap was sutured with 4/0 monocryl [Figure 6].

Statistical analysis

Quantitative variables were expressed as Mean \pm SD or mean [Range] and qualitative variables as frequency (%). Due to non-normality of studied quantitative data Mann-Whitney U-test, while Chi-square test was used for comparing the qualitative variables. All statistical analysis was conducted using SPSS statistical software version 16 (SPSS Inc., Chicago, IL, USA).

RESULTS

Among 29 study sample, 20 (68.9%) people had large, 6 (20.7%) had medium and 3 (10.4%) had small sizes of fistula. 7 (24.1%) fistula were located at the junction of soft and hard palate and in 22 (75.9%) patients hard palate fistula were detected. 14 patients were experienced first time of recurrence that were repairing with this method, and in 15 patients correction of ONF were performed previously by various procedures. The mean (\pm SD) of operation time was 75 ± 15 min and the duration of hospitalization was varied between 1 and 3 days.

The study sample consisted of 14 patients who were experienced first time of recurrence that were repairing with this method, and in 15 patients, correction of ONF was performed previously by various procedures. During 2 years followup, the recurrence rate among 14 patients was 1 (7.1%), while among 15 patients was 5 (33.3%) ($P < 0.001$) and overly we detected recurrence of ONF in 6 patients (20.68%) and the success rate was 79.32%. The characteristics of 6 patients who experience recurrence were as follow: 1 patient experienced first time of recurrence and his fistula size was 17 mm, 2 patients experienced the second time of recurrence and their fistula sizes were 12 and 14 mm, 2 patients tolerated



Figure 1: Evaluation of fistula

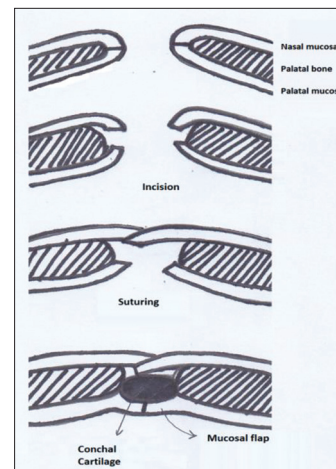


Figure 2: Creation of palatal mucoperiosteal flap



Figure 3: Harvested conchal cartilage

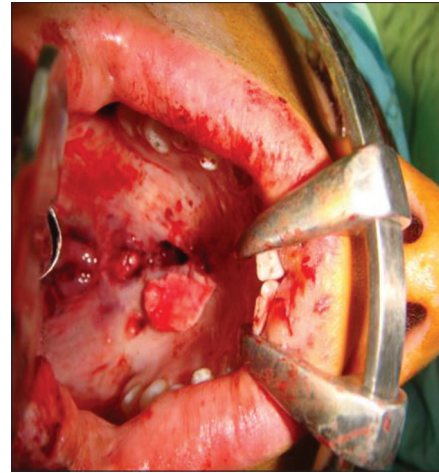


Figure 4: Fitness of cartilage with defect sizes

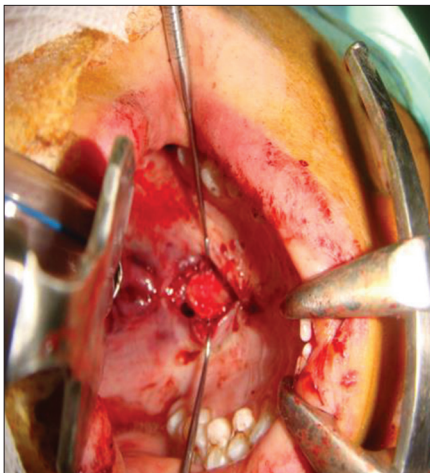


Figure 5: Insertion of cartilage in pocket

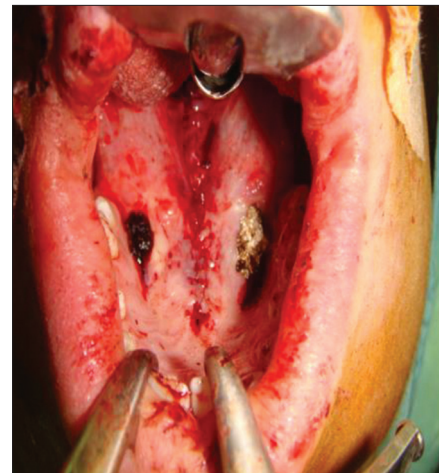


Figure 6: Complete repair

from a third time of recurrence and their ONF sizes were 10 and 11 mm and 1 patient encountered with the fourth time of recurrence, and his fistula size was 9 mm. Accordingly, the possibility of recurrence of ONF in the presence of larger fistula size and the greater number of previous surgery was increased that is, there was an interaction between size of the fistula and the number of previous surgeries. Therefore, using of conchal cartilage graft for recurrent ONF with ≤ 1 cm and a single recurrence can be considered as a safe and efficacious approach, while in ONF > 1 cm and several recurrence conchal cartilage graft can be used as a primary method and if recurrence were occurred again, other complex procedure should be considered.

The mean (\pm SD) age of failed and successfully repaired patients were 11.3 (± 4.5) and 8.4 (± 5.25) years, respectively ($P > 0.1$).

We detected the first symptom of ONF after 5 months from the operation. No patients were complained from donor site complication and discomfortable.

DISCUSSION

In this study, we tried to evaluate the efficacy and recurrence rate of ONF after utilizing conchal cartilage graft. During these decades, several procedures have been introduced, and their result and complexity have been evaluated. The overall failure rate of ONF closure was around 37%^[11] and increased as high as 65% in second or further procedures.^[17]

Honnebier *et al.* were evaluated the safety and failure rate of ONF by using a standard mucoperiosteal flap lined with a buccal mucosal graft during two years followup, and they reported that in all cases (7 patients) the fistula was completely closed at first attempt without complications and evidence of recurrence.^[12] In this study, their sample volume was low and further evaluations are warranted.

Steale and Seagle have suggested the use of acellular dermal matrix (AlloDerm) in palatal fistula repair has reduced their failure rate from 16.7% to 0% and there were no complications, so using this procedure is safe and effective over time.^[18]

González-Sánchez *et al.* have acclaimed that during their follow up (6-24 month), by using of plasma rich in growth factor mixed with autologous bone graft, complete closure of ONF was achieved in 90.9%, hence this procedure seems to be an effective, safe and low-cost technique.^[19]

Local double-breasted mucoperiosteal flap was introduced as a simple successful procedure for repair of ONF by Anani *et al.*, and none of their patients developed any significant postoperative infection, bleeding and recurrence.^[20]

Nakakita *et al.* showed that repaired ONF by utilizing of a buccalmusculomucosal flap, complete closure at the first attempt was obtained in 69% of the patients, but in this method they needed to divide the pedicle of the flap in the second operation after 2 weeks.^[21]

In Assuncaostudy, tongue flap have been used for ONF closure, and partial recurrence was seen only in one case out of 12.^[22] Furthermore, in other study that was performed by Guzel and Altintas, used the same type of flap, recurrence of ONF occurred in one out of ten patients.^[23] However, after tongue had flapped the patients experienced changes in articulation and resonance as complications that have been reported by Kummer and Neale.^[24]

In some studies recurrence rate of ONF were investigated after using of free flap from different donor site, including dorsalispedis free flap,^[25] osseous angular scapular flaps^[26] and mucosal prelaminated lateral upper arm flap.^[27] These procedures were complex, and patients had donor site discomfort too.

Mosaad Abdel-Aziz have been evaluated the efficacy of closure of ONF using V-Y two layers method. They selected younger patients and have not detected any recurrence. They suggested the advantages of their method is that; it is a single stage operation, familiar to the cleft palate surgeons, and it causes no pain in another area of the body, but sometimes due to tissue fibrosis specially when the number of the previous operation were great, elevation, replacement and insertion of the flap is difficult.^[28]

Overall failure rate of ONF closure was 37% and increased in second and further procedures. Localized flap can be used for ONF repair, but mucosal palatal rigidity specially when accompanied with tissue scarring, can bothered surgeons and need more complicated techniques with all difficulties and drawbacks.

Some authors reported the anterior approach by total palatal elevation as mucoperiosteal flap for fistula closure and reported success rate of fistula repair as high as 96.9% in the first attempt at fistula closure and 82.1% in the previously

operated fistulae group. They claimed that the repair was completed with minimal tension preventing secondary scarring over the exposed palatal bone which may interfere with an arch growth, alignment and orthodontic treatment.^[29,30]

Interpositional grafts of bone,^[31] free periosteum,^[32] fatty dermal graft^[33] and conchal cartilage graft^[2,14] to separate the oral and nasal layers and to complete a three-layered closure, have also been reported with better success rates. The three-layered repair provides more safety margin in cases of the partial repair disruption than the conventional two-layered procedures.^[16]

Abed Mohsen allen and SLA jeffy were evaluated conchal cartilage for ONF repair in two different studies, and their successful rate were 81.25% and 79%, respectively. However their sample volume were low (16 and 14 respectively).^[2,14]

The advantage of conchal cartilage utilizing in our study was protected from infection and air leakage. Early epithelialization was seen and by using this cartilage epithelial cell movement toward each other from nasal and oral aspect of the flap was prevented, so ONF did not occur. The other beneficial effects of this method are single stage operation and provide more safety margin due to three-layered repair of ONF.

CONCLUSION

Using of conchal cartilage graft for recurrent ONF with ≤ 1 cm was safe and efficacious, in ONF > 1 cm conchal cartilage graft can be used as a primary method and if recurrence occurred, choose other complex procedure

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AUTHORS' CONTRIBUTIONS

All authors participated in designing and conducting the study. AF drafted and edited the manuscript. All authors read and approved the manuscript.

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