

Repair of Wide Cleft Palate by Bilateral Buccal Fat Pad: A Preliminary Study

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Introduction: This study aimed to prospectively assess the effectiveness of the use of the bilateral buccal fat pad (BFP) for wide cleft palate reconstruction and its effect on transverse palatal growth and fistula formation. **Materials and Methods:** Buccal fat pad was utilized for treatment of wide palatal cleft patients managed by at Department of Oral and Maxillofacial Surgery of Ahvaz Jundishapur University of medical sciences. Also, an electronic search of articles was performed in Medline and PubMed database from January 1990 to May 2015 to review the literature and summarize the utilization of BFP graft in reconstruction of palatal defects. **Results:** Ten wide palatal cleft patients were enrolled in this study from 2009 to 2015. Age ranged from 1.5 to 18 years with a mean of 6 in all cases and 2.4 in growing patients. The exposed BFP fully epithelialized within 4 weeks. No palatal fistula type III or IV was observed in follow-up. Palatal transverse growth was not adversely affected in seven growing patients in the follow-up time. **Conclusion:** The results of this study may suggest application of pedicled BFPs to support and fill nasal layer, raw bone, dead space between oral and nasal layer and hypoplastic muscles to prevent fistula formation and severe scar contracture.

Keywords: Buccal fat pad; Cleft palate; Reconstructive surgery

Introduction

Wide cleft palate is the most severe type of congenital cleft palate disease and palatal fistula remains a significant problem for clinicians regardless of the type of repair. Various local flaps have been used to achieve primary closure in wide cases of cleft palate. Even though the surgeon performs complete closure, secondary oronasal fistula and severe scar contracture and subsequent growth disturbance may develop due to great raw bone surfaces. Decreasing complications and improving surgical outcomes is the main concern for the surgeon (1-6).

Pedicled buccal fat pads (BFP) have been utilized since Egyedi (7) first used it in closure of an oronasal fistula in 1977. Since then several studies have described potential of BFP in reconstruction of oral defects and also its use for facial esthetic surgeries (8-10). However, BFP grafts were previously

used as an adjuvant for coverage of alveolar bone grafts and later it was utilized for primary cleft repair (11).

Anatomically, BFP is an encapsulated, rounded, and biconvex, mainly adipose structure with an excellent blood supply from maxillary, superficial temporal, and facial arteries. This triple vascular system allows the use of this tissue without significant risk of necrosis (12-14). Due to easy manipulation, rich blood supply, minimal complications, great success and lack of scar at the donor site, this source is becoming popular in the treatment of palatal defects (15). Recently, some surgeons reported the application of unilateral or bilateral pedicled BFP for nasal membrane closure at the site of maximum tension, the junction between soft and hard palate, in cleft palate repair (16-18).

The present study evaluated the effectiveness of interposing bilateral pedicled BFP in reconstruction of wide cleft palates to prevent palatal fistula formation and maxillary transverse constriction.

Table 1. Summary of cases.

Case	Gender	Age(Y)/ Follow-Up Time(Y)	Type	Postoperative Fistula (III-IV)	Transverse Growth Disturbance
1	Male	2/4	Bilateral/VMPP	No	No
2	Male	1.5/5	Unilateral	No	No
3	Female	12/4	Bilateral/VMPP	No	No
4	Female	1.6/3	Unilateral	No	No
5	Male	18/2	Bilateral	No	No
6	Female	1.5/2	Isolated/VPPP	No	No
7	Male	3.7/3	Unilateral	No	No
8	Male	14/1	Bilateral	No	No
9	Female	4.5/3	Unilateral/VMPP	No	No
10	Male	2/5	Unilateral	No	No

Material and Methods

This prospective clinical study was performed on the patients referred to Department of Oral and Maxillofacial Surgery at Ahvaz Jundishapur University of Medical Science from 2009 to 2015 for reconstruction of wide palatal cleft. The inclusion criteria were wide palatal clefts and vertical palatal shelves whether complete, incomplete or isolated (Figure 1). The exclusion criteria were narrow clefts, platelet dysfunction, history of previous surgery and previous scar. The procedure and application of bilateral BFPs were explained to the patients or their parents and informed consent forms were obtained. All operations were performed by a single surgeon and evaluated by another surgeon. All patients received the bilateral pedicled BFP as an adjuvant reconstructive measure in a separate layer for nasal layer coverage. Preoperative physical examination demonstrated no other abnormalities, such as upper respiratory tract infection, ear infection, anemia, or other congenital anomalies other than cleft palate. Laboratory test results and electrocardiograms were normal. None of the patients were involved in orthodontics treatment in pre- or post-operative follow-up periods.

The operation was performed under general anesthesia with oral intubation. All patients received a single dose of cefuroxime (30 mg/kg) (Farabi Pharmaceutical Co, Isfahan, Iran) before incision. Then the proposed lines of incisions of the mucoperiosteum and margins of the cleft were infiltrated with 2% lidocaine with 1:100000 adrenalin (Daropakhsh, Tehran, Iran). According to two flap palatoplasty or von logen beck technique (with extended relaxing incisions in alveolar area), mucoperiosteal flaps were raised from the palate, and vomer and mucoperiosteum on the nasal side of the palatal shelf were widely dissected. Due to hypoplastic

vomer bone, use of its mucoperiosteum was not feasible in three patients. The greater palatine vessels were isolated from the foramen and off the palatal flaps. The muscles of the soft palate were separated from the posterior edge of the hard palate and hamulus process entirely to reduce tension. The entire muscles was repositioned and the muscles were reoriented. Following suturing the nasal layer, blunt dissection was performed laterally from the site of BFP. The body and buccal extension of the pad were isolated gently while digital pressure was applied below the zygomatic arch to help herniation of the BFP tunnel beneath the existing palatal mucoperiosteal flap, and behind the released greater palatine vessel. Care should be taken to gently isolate the pedicle to its maximum extent without damaging the capsule or separating globules of fat or other important structures, including branches of the facial nerve and parotid gland duct. The fat pads were placed into the cleft area as a distinct layer from soft palate to alveolar ridge and sutured to each other in the middle (Figures 1A-C). Finally the muscles and oral mucous layers were sutured separately. A layer of BFP was placed between the oral and nasal layer, furthermore the exposed bones were also covered by this means. This BFP layer may serve as a preventive measure to decrease tissue contracture and future possible dehiscence. All patients received a 5-day regimen of oral amoxicillin (50 mg/kg/day) (Farabi Pharmaceutical Co, Isfahan, Iran) postoperatively. The patients were spoon-fed with a liquid or soft diet for two weeks and were instructed to rinse mouth twice daily. Follow-up examinations were performed in patients to evaluate effectiveness of application of BFPs in surgical outcomes (Figures 1D-E). The upper and lower jaw relationship was evaluated by examining overjet and serial lateral cephalograms to assess transverse maxillary constriction.

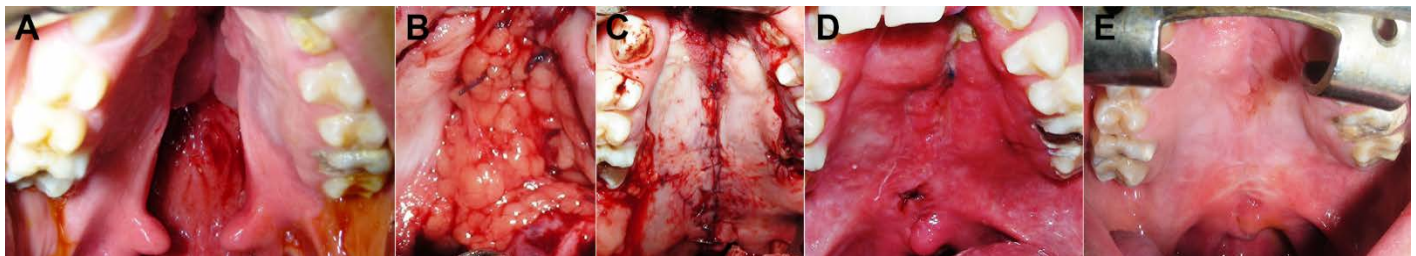


Figure 1. (A) Preoperative view of wide bilateral cleft palate with vertically misplaced palatal processes; (B) Intraoperative view of use of bilateral BFPs for coverage of nasal layer and space between nasal and oral layer and raw bony surfaces in laterally incised area; (C) Immediate postoperative view. The laterally released areas are filled by BFPs; (D) One month post-operative view, after reconstruction and the BFPs are completely epithelialized; (E) 2 years post-operative view following reconstruction

Results

The study design was reviewed and approved by the university institutional review board. Ten patients were included in this study, including six males and four females who were diagnosed with wide cleft palate which the width of both palatal shelves were less than the width of palatal defect (19, 20).

The age ranged was 1.5 to 18 years with a mean of six in all cases and 2.4 in growing patients. Four patients had bilateral cleft palate; five patients had unilateral and one patient had isolated cleft palate. Four had misplaced, severe vertically positioned, palatal process (Table 1).

In post-operative follow-up no significant complications including hematoma, infection, arterial bleeding, perforation, dehiscence, injuries of the facial nerve or Stenson duct related to the donor site of the BFP graft or the grafting procedure was detected. The patients only experienced pain and swelling that had resolved within eight days; no remarkable change was occurred in facial contour. The exposed BFP was fully epithelialized within four weeks. During the operation, the nasal layer was injured at the junction of soft and hard palate in four patients due to excessive tension and also posterior to incisive foramen in two patients due to misplaced palatal shelves and limited access. No palatal fistula type III or IV was observed in the period of follow-up. Palatal transverse growth was not adversely affected in seven growing patients in the follow up time.

Discussion

Cleft lip and palate is a common congenital deformity and wide complete cleft lip and palate is one of the most severe types of this deformity. Even today, cleft palate is one of the greatest challenges in reconstructive surgery. However, in palatal clefts

with wide defect or vertically positioned palatal shelves, it is usually difficult to achieve full nasal mucosa closure due to tissue tension and injury to delicate nasal layer. Conventional palatoplasty generally involves paring of the margins of the cleft and mobilizing the tissue for approximation in the midline to achieve closure. Although in case of full closure, the scar contracture produced by extra manipulated and injured hypoplastic tissues and secondary healed surfaces of denuded palatal bones increases rate of fistula formation. The probability of fistula formation is estimated to range from 5 to 29% (21) in overall cleft operations and as high as 70% in wide cleft reconstruction (20). It is assumed that formation of postoperative dehiscence or fistula may be related to the width of the defect, the amount of deficiency of the palatal segments, misplacement and distortion of the cleft segment, surgical procedure and experience of surgeon (22). It is estimated that once the ratio of palate width to defect thickness exceeds beyond 3:1, the incidence of postoperative fistula formation increases up to eight time (23). Another study found that the risk of fistula formation significantly increases when the proportion of cleft width to posterior arch width increases to 0.40 or more. Also, as the ratio between the cleft width and the sum of the width of the two palatine shelves increases to about 0.50 or above, the risk of fistula formation increases significantly (20). Difficulty of wide cleft palate reconstruction, higher rate of fistula formation and severe maxillary growth disturbance tempted surgeons to utilize local flaps to decrease tissue tension and scar contracture in order to compensate the deficiency of hypoplastic tissues.

Unilateral and bilateral mucosal or myomucosal buccal (cheek) flap have been proposed as a nasal lining when the nasal mucosa is splitted and a defect is created or in case of cleft defect reconstruction (15-26). However, local flaps were associated with some disadvantages, including the need for a second surgical site, defect and scar contractor in buccal area,

potential microsomia, the chances of injuring the Stenson duct and the limitations in flap width in infants. The tongue flap, (27) mucoperiosteal palate island flap (28) and other techniques were advocated to achieve more sophisticated coverage of this area, but they were associated with complications as well. Although the buccal fat pad has been used in primary cleft palate surgery for filling the lateral release defect, (15) its application for nasal membrane closure particularly at the junction of soft and hard palate have been reported recently (16-18, 29).

The advantages of BFP in a pedicled form are the simple harvest and easy technique, proximity to the surgical site, abundant vascular supply, high success rate, lack of visible scar at the donor site, minimal discomfort for the patient, and low rate of complications (7, 8, 24, 25).

In the present study BFP was utilized for complete coverage of nasal layer as the forth layer in soft palate particularly in hard and soft palate junction, and as the third layer in hard palate repair and also to fill defects created by lateral incisions. We applied this technique in 10 patients with wide cleft, with no perioperative or postoperative complications including infection, dehiscence and type III & IV fistula. Despite of nasal membrane injury in six patients, the healing was perfect without fistula formation. No fistula was detected in the follow up period post operatively. Maxillary growth was evaluated in seven growing patients and transverse palatal disturbance was not detected in alveolar area. This study did not include any peri- or post-operative complications related to the donor site similar to previous studies (8, 16-18, 29).

The underlying reason for early dehiscence and fistula are technical errors such as closure under tension, poor handling of tissues and failure to achieve a layered closure (20), hence use of a bilateral pedicled fat pad graft as a separate layer in wide primary cleft palate reconstruction offers distinct advantages such as extending the soft palate without generating tension from the nasal side, enhancing articulation of the patient by decreasing of transverse palatal tension, and ease of harvest (21).

Conclusion

The results of the present study have demonstrated the potential of use of pedicled BFPs in supporting and filling nasal layer, raw bone, dead space between oral and nasal layer and hypoplastic muscles to prevent fistula formation and severe scar contracture which are two major short and long term complications in wide cleft reconstruction. Although this study

has limitations such as limited number of samples and lack of evaluation in velopharyngeal mechanism and long term midfacial growth, it was demonstrated that application of the bilateral BFPs have favorable results as an appropriate adjuvant therapy in difficult palatal cleft reconstruction. We recommend further studies with larger sample size and precise measurements such as evaluation of patients in vertical, horizontal and sagittal planes with radiographs and orthodontic casts.

Conflict of Interest: 'None declared'.

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