

The Need for Lateral Piriform Rim Augmentation in Patients with Unilateral Cleft Lip/Palate During Alveolar Cleft Bone Grafting

Amin Rahpeyma · Saeedeh Khajehahmadi

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Abstract

Background Alveolar bone grafting in unilateral cleft lip/palate (CLP) patients can improve nasal symmetry and facial esthetic. In some cases lateral piriform hypoplasia cannot be compensated by soft tissue thickness of the face, necessitating onlay bone grafting. This study was designed to estimate the proportion of patients among unilateral CLP patients requiring this procedure.

Materials and Methods In a retrospective study, unilateral CLP patients with severe paranasal deficiency, who were managed by paranasal augmentation with cortico-cancellous bone graft during the alveolar cleft bone grafting, were included.

Results From 85 unilateral CLP patients treated from 2005 to 2011 in the Oral and Maxillofacial Surgery Department, Mashhad University of Medical Sciences, fourteen patients were treated with lateral piriform augmentation technique. Mean age of the patients at the time of operation was 16 ± 4.8 years. Follow-up period was 2–6 years.

Conclusion Concomitant alveolar bone grafting and lateral piriform augmentation is needed at least in 16.5 % of unilateral CLP patients.

Keywords Alveolar bone grafting · Lateral piriform augmentation · Unilateral cleft lip and palate

Introduction

Alveolar bone grafting (ABG) is an important surgical step in the management of cleft lip/palate patients [1]. It has esthetic results apart from benefits obtained from closure of oronasal fistula in the alveolar cleft region [2, 3].

It provides a sound basis for further orthognathic surgery and rhinoplasty [4, 5]. Proper alveolar cleft bone grafting will reconstruct the nasal floor at the same level as unaffected side (in unilateral cases) and elevate nasal ala [6–8].

In unilateral cleft lip/palate patients, paranasal deformity on the side adjacent to the cleft margin is more pronounced in comparison to the unaffected side (Fig. 1). Correction of paranasal deformity can be made at the same time as the alveolar cleft bone grafting or during rhinoplasty. This study was designed to make an estimation of the percentage of patients among unilateral cleft lip/palate (CLP) patients needing paranasal onlay bone grafting concomitant with ABG.

Materials and Methods

In a retrospective study, unilateral CLP patients with severe paranasal deficiency, who were managed by paranasal augmentation with cortico-cancellous bone graft during the alveolar cleft bone grafting, were included. Bilateral CLP patients were excluded from the study. Post-operative panoramic views and at least 1-year of follow-up were considered to evaluate the possibility of root damage in

A. Rahpeyma
Oral and Maxillofacial Diseases Research Center, School of Dentistry, Mashhad University of Medical Sciences, Mashhad, Iran
e-mail: rahpeymaa@mums.ac.ir

S. Khajehahmadi (✉)
Dental Research Center, School of Dentistry, Mashhad University of Medical Sciences, Vakilabad Blvd, P.O. Box 91735-984, Mashhad, Iran
e-mail: khajehahmadis@mums.ac.ir;
saeedeh.ahmady@yahoo.com



Fig. 1 The nasal ala and paranasal region depressed in the cleft side



Fig. 2 Fixation of onlay bone graft with miniscrew

maxillary canine adjacent to the cleft. Direct contact of the fixation appliance with canine root was considered a therapeutic error.

Surgical Technique

After closure of the oronasal fistula and alveolar cleft bone grafting, the periosteum overlying the piriform rim in the affected side was undermined. With placement of molded bone wax beneath the periosteum, the required bone for paranasal augmentation was estimated; then a block of cortico-cancellous bone graft harvested from the anterior iliac crest, was transferred to the paranasal region and fixed with a mini-screw by “lag screw” type technique (Fig. 2).

Table 1 Demographic information of fourteen unilateral alveolar cleft patients treated with lateral piriform augmentation technique concomitant with ABG

	Sex	Age at operation	Right or left	Follow up (years)
1	M	19	Right	6
2	F	17	Left	7
3	M	13	Left	6
4	M	19	Left	6
5	F	23	Left	5
6	M	9	Left	5
7	M	12	Left	5
8	F	22	Left	2
9	F	15	Left	5
10	F	16	Left	5
11	M	10	Right	5
12	F	13	Left	3
13	F	16	Left	2
14	M	25	Right	3

M male, *F* female

Sharp edges were trimmed with a round surgical bur, followed by the soft tissue closure over the grafted bone by lateral sliding mucoperiosteal flap.

Because of the added volume beneath the periosteum, wound closure was more difficult, necessitating more periosteal hatching; even in some cases distal soft tissue flap cut-back was required.

Results

Of 85 unilateral CLP patients treated from 2005 to 2011 in the Oral and Maxillofacial Surgery Department, Mashhad University of Medical Sciences, 14 patients were treated with lateral piriform augmentation technique. Demographic data of the patients are presented in Table 1. In two patients lip split approach was used for major lip repair, along with wide access for nasal floor reconstruction. In the others the intraoral incisions were used for this purpose.

A total of 50 % of patients were females and 70 % of unilateral clefts were located on the left side. Post-operative radiographs showed no interference of the appliance used for internal fixation of paranasal bone block with tooth root except in one case (Fig. 3). There was a case of alveolar cleft bone graft failure while the onlay graft of the piriform rim survived (Fig. 4).

Mean age of the patients at the time of surgery was 16 ± 4.8 years. Follow-up period was 2–6 years. Donor site in all the patients was the anterior iliac crest.

In this study only 14 % of patients were under 10 years of age, which is an ideal age for ABG (Fig. 5). A complication

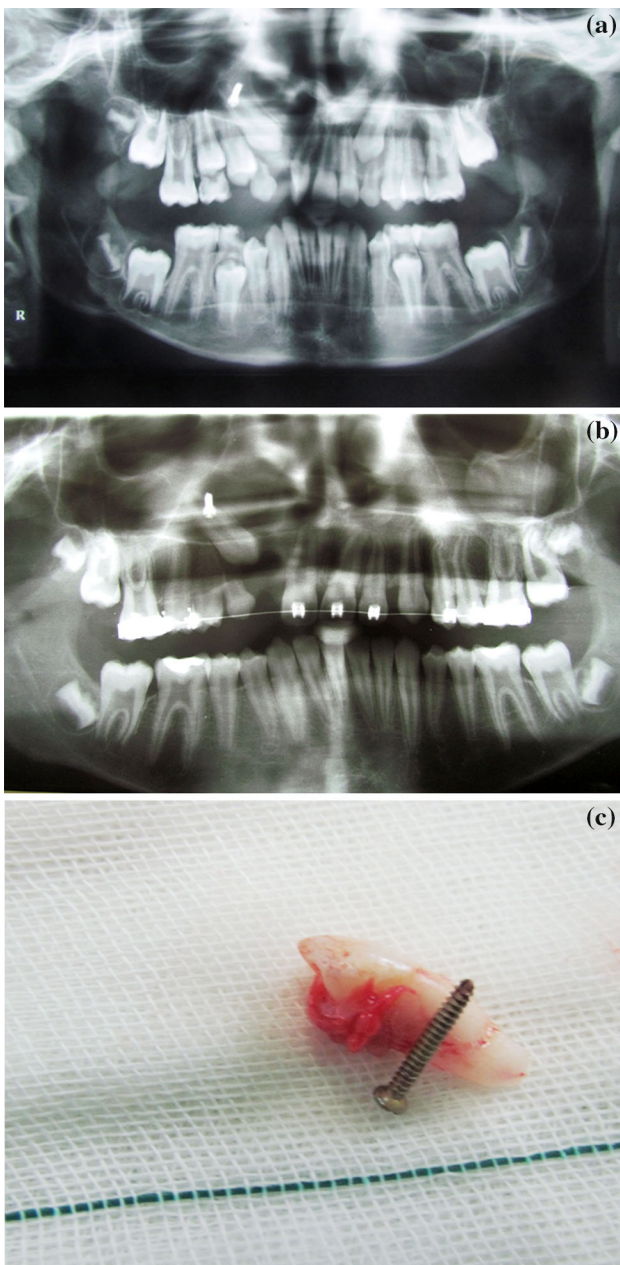


Fig. 3 Interference with canine tooth eruption. **a** One month postoperation. **b** 2 years after surgery. *Note* that left canine is normally erupted while in the cleft side the permanent canine is retained. **c** Removed tooth and screw

involving a tooth root happened in a 10-year-old male patient.

Discussion

Alveolar cleft bone grafting has positive effects on facial esthetic [9]. In unilateral alveolar cleft patients, paranasal deficiency is more pronounced in comparison with bilateral



Fig. 4 Survived onlay grafted lateral piriform despite failed alveolar bone grafting

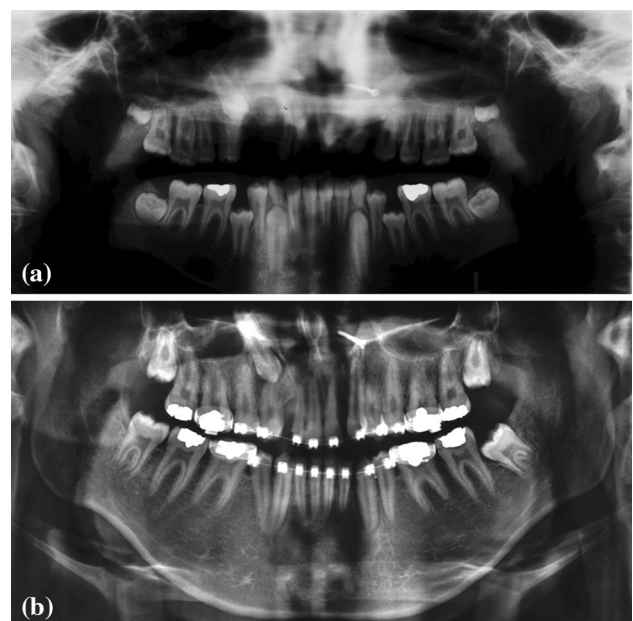


Fig. 5 Lateral piriform augmentation in mixed dentition. **a** OPG 1 month after surgery. **b** Five year follow up graphy

alveolar cleft patients. The lateral piriform rim area needs special attention during bone grafting [10].

This procedure dramatically improves the esthetic results in unilateral alveolar cleft patients (Fig. 6) [11]. Not all the unilateral alveolar cleft patients need this operation; only 16.5 % of these patients in this study needed this operation. This is parallel with a study by Miyamoto, who showed that cleft side piriform margin depression does not necessarily lead to alar depression in all the cases [12].

Ordinarily alveolar cleft bone grafting will elevate the nasal floor and nasal ala but will not correct the paranasal deficiency. According to the study of Sander et al., mixed dentition alveolar bone grafting appears to have no significant long term effect on nasal morphology, symmetry or

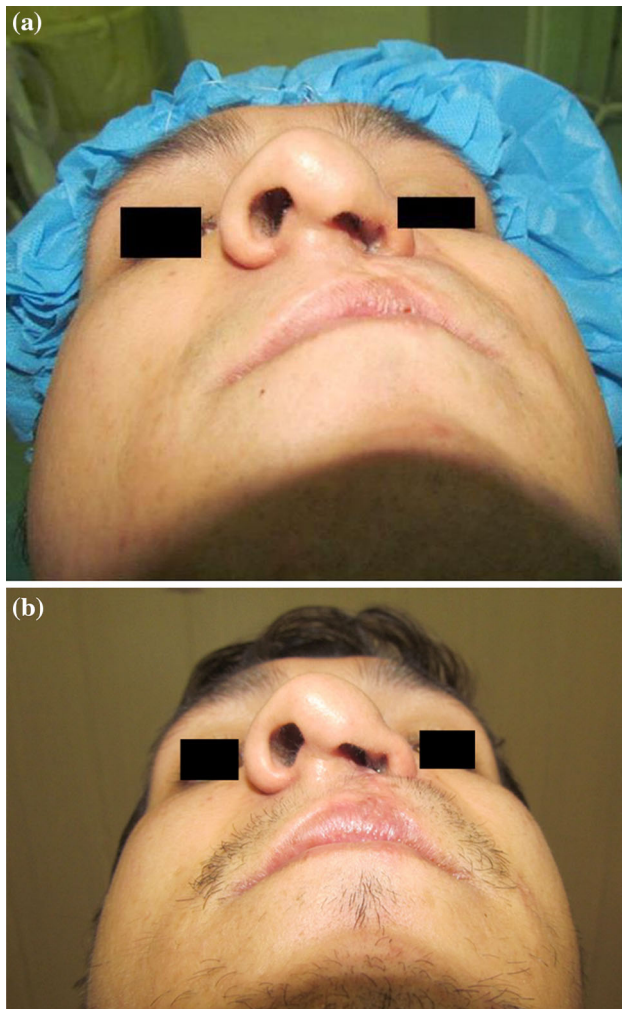


Fig. 6 Improvement in facial esthetic after concomitant alveolar bone grafting and lateral piriform augmentation. **a** Pre-operative worms view of the patient. **b** 6 months after lateral piriform augmentation

nasal shape so paranasal deficiency needs special attention during alveolar cleft bone grafting. Augmentation of the alar base with a bone block graft secured in place with titanium miniscrew can solve this problem [13, 14]. Concomitant ABG and lateral piriform augmentation was called “anterior maxillary bone grafting” by Li et al. [15].

Potential complications of paranasal augmentation in unilateral alveolar cleft patients include difficulty in wound closure and possibility of damage to the root of permanent unerupted maxillary canine.

The first situation can be managed by more periosteal hatching, distal cut-back and rounding of the bony edges of grafted bone with a surgical bur.

The second problem is not a concern in adult alveolar cleft patients but in early secondary bone grafting, which is the best time for alveolar cleft bone grafting, there is a real danger that can be prevented by careful selection of

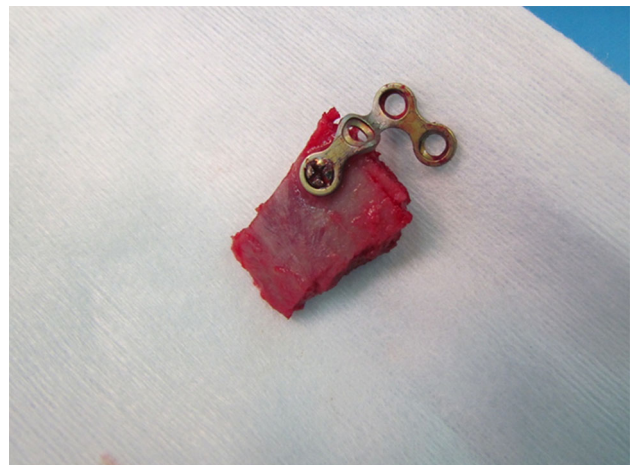


Fig. 7 Suggested way for prevention of root damage in lateral piriform augmentation during mixed dentition is fixation of the onlay graft with mini/micro screw

osteosynthesis site. Fortunately in this age group there is less need for this operation and only 14 % of the patients in this study were in this age group. If the estimated risk of the injury to the tooth germ is high, then monocortical fixation of the onlay graft and fixation with mini/micro-plate in more cephalic position, should be considered (Fig. 7). Experimental study in sheep has confirmed that graft fixation will decrease the risk of onlay bone graft movement and resorption [16]. One titanium screw is sufficient for this purpose [17].

This study showed that lateral piriform augmentation concomitant with alveolar cleft bone grafting is a much needed procedure in late alveolar cleft bone grafting. The need for ABG concomitant with lateral piriform augmentation should be carefully evaluated before ABG because it can influence the choice of donor site and achieve better results. Donor site in all the patients was the anterior iliac crest and no case of chin or tibia bone graft had been recorded as the donor site. This is attributed to the limited available volume of cortical bone in the chin and the fact that the tibia is a source of cancellous bone in ABG.

Conclusion

Concomitant alveolar bone grafting and lateral piriform augmentation is necessary in at least 16.5 % of unilateral CLP patients.

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Conflict of interest None declared.

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