



Eruption of Impacted Teeth in Cleft Lip and Palate Patients following Alveolar Bone Graft

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ABSTRACT

Introduction: This study aimed to assess the eruption of impacted teeth in cleft lip and/or palate (CLP) after alveolar bone graft.

Materials and methods: Research was carried out through a cross-sectional study at the Craniofacial Rehabilitation Center of the University General Hospital of the University of Cuiabá, Mato Grosso, Brazil. Variables related to cleft, cleft side, gender, age, laterality of cleft, impacted teeth, and orthodontic traction were analyzed.

Results: Forty-two patients treated at the institution from 2004 to 2011 had their charts retrospectively reviewed. They were 54.7% male and 45.2% female. The group aged 9 to 11 years was most affected, representing 59.5% of cases. A unilateral cleft was the most prevalent craniofacial anomaly (85.7%). A total of 57 impacted teeth were observed. Maxillary canines were the most commonly impacted teeth (97.6%) and the most frequently identified in patients with a transformen incisor cleft (TIC) (76.3%). Orthodontic traction was required for both impacted maxillary canines and impacted lateral incisors (64.3 and 35.7% respectively). The orthodontic traction was required only in patients with a TIC ($p = 0.0101$).

Conclusion: The canine teeth were the most commonly impacted teeth, found mainly in patients with a TIC. After placement of the alveolar bone graft in patients with a preforamen incisor cleft (PIC), all impacted teeth erupted spontaneously.

Clinical significance: An impacted tooth can have negative consequences on a patient's quality of life. Thus, a survey evaluating the incidence and prognosis of impacted teeth after an alveolar bone graft for CLP was important.

Keywords: Alveolar bone graft, Cleft lip, Cleft palate, Tooth eruption.

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INTRODUCTION

Cleft lip, cleft palate, or both together (CLP) are congenital malformations that compromise the integrity of the lip and palate. The etiology is not completely understood. Most frequently, its occurrence is explained using the multifactorial theory, which can be summarized as the interaction of genetic and environmental factors that act alone or in association with infectious diseases, drugs with teratogenic potential,¹⁻³ chemicals and nutritional deficiencies during pregnancy.^{2,3}

The prevalence of CLP varies according to geographical location and ethnic group, being more common in those of Asian ancestry,^{4,5} affecting 1 to 2 individuals per 1,000 live births,^{1,4,6} whereas the prevalence in Brazil is 1 in every 700 live births. The CLP is the most frequently encountered craniofacial anomaly.⁷⁻⁹

The CLP is one of the primary causes of tooth impactions.¹⁰⁻¹² When located in the alveolar ridge, the presence of impacted teeth adjacent to the cleft often requires bone grafts in the region prior to the eruption of these teeth.¹³⁻¹⁵

Bone grafts are surgical procedures involving the removal of a small amount of the patient's own bone (i.e., autologous bone graft) and transplanted into the area of bone defect.^{16,17} The ideal age to place the secondary bone graft is approximately 8 to 12 years, considering

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that the upper canine tooth adjacent to the cleft has 2/3 of the root formed.¹²

A primary bone graft corresponds to a graft performed in the cleft area in early childhood. However, when bone grafting is performed near the end of the mixed dentition period, and preferably before the eruption of the permanent canines, it is termed a secondary bone graft. This type of bone graft is used to provide better periodontal support and better conditions for the eruption of teeth adjacent to the cleft.¹⁸

Thus, the aim of this study was to assess the eruption of impacted teeth after secondary alveolar bone grafting in CLP patients.

MATERIALS AND METHODS

The study was approved by the Ethics in Research Committee of the University of Cuiabá UNIC/Mato Grosso, protocol number 2011/157.

This is a cross-sectional study, involving patients treated at the HGU-UNIC Craniofacial Rehabilitation Center between November 1, 2004 and December 31, 2011.

The archives, files, and panoramic radiographs of all the patients treated for CLP at the Rehabilitation Center in the University General Hospital of the University of Cuiabá (HGU-UNIC) were analyzed, according to the following variables: Gender, age, cleft type, cleft side, laterality of cleft, impacted teeth and orthodontic traction.

Following established inclusion and exclusion criteria and review of 646 patient charts, 42 were selected for this study. The inclusion criteria were: Medical records of patients with a CLP with impairment of the alveolar ridge and at least one permanent tooth included in the margins of the cleft at the time of secondary bone grafting; patient with mixed dentition independent of chronological age. The exclusion criteria were: Patients with incomplete data; no initial panoramic radiograph or control; damaged radiographs; patient records containing a diagnosis of a systemic disease or syndrome and patients who underwent an extraction of an impacted tooth at the time of bone graft.

After collecting the data, descriptive statistical analysis was performed to establish the relative and average frequencies. Possible association between the variables were evaluated using the chi-square test. A p-value <0.05 was considered statistically significant.

RESULTS

Out of 42 patients with a CLP, it was most prevalent in males, 54.76% (n = 23). It was most frequently observed in patients between 9 and 11 years of age, 59.53% (n = 25). The data regarding the frequency of the variables cleft

Table 1: Distribution of patients with CLP according to the variables: gender, age group, cleft type, cleft side and laterality of cleft (n = 42)

Variable	n	%
<i>Gender</i>		
Female	19	45.24
Male	23	54.76
<i>Age group (years)</i>		
9–11	25	59.53
12–14	12	28.57
15–16	05	11.90
<i>Cleft type</i>		
PIC	09	21.43
TIC	33	78.57
<i>Cleft side</i>		
Right	20	47.61
Left	27	64.28
<i>Laterality of cleft</i>		
Unilateral	36	85.71
Bilateral	06	14.29
<i>Impacted teeth (n = 57)</i>		
Maxillary canines	41	97.61
Lateral incisors	16	38.01
<i>Orthodontic traction (n = 54)</i>		
Yes	14	33.33
No	40	95.23

Table 2: Distribution of cleft type and cleft side according to the gender of patients with CLP

	Cleft type (n = 54)			Cleft side (n = 60)		
	PIC (%)	TIC (%)	p-value	Right (%)	Left (%)	p-value
<i>Gender</i>						
Female	11 (78.6)	14 (35)	0.0048	9 (36)	17 (48.6)	0.3326
Male	3 (21.4)	26 (65)		16 (64)	18 (51.4)	
Total	14 (100)	40 (100)		25 (100)	35 (100)	
Chi-square Pearson						

type, cleft side, cleft laterality, impacted teeth, and orthodontic traction are shown in Table 1.

Table 2 shows the distribution of cleft type and cleft side according to gender, and it was significant for cleft type (p = 0.0048) but not cleft side (p = 0.3326).

Table 3 shows the distribution of impacted teeth according to the variables gender, cleft type, and cleft side. All differences were not significant (p < 0.05).

Table 4 shows the distribution of orthodontic traction according to the variables gender, cleft type, cleft side, and impacted teeth. Orthodontic traction was more common in males, 57.1% (n = 8); TIC 100% (14); cleft side 71.4% (n = 10), and maxillary canines 64.3% (n = 9). However, only the variable "cleft type" was considered significant (p = 0.0101).

DISCUSSION

Cleft lip and CP are developmental abnormalities that affect individuals of both genders. In this study, males

Table 3: Distribution of impacted teeth according to the variables: gender, cleft type and cleft side of patients with CLP

	Maxillary canines (%)	Lateral incisors (%)	p-value
<i>Gender</i>			
Female	20 (48.8)	6 (37.5)	0.4422
Male	21 (51.2)	10 (62.5)	
<i>Cleft type</i>			
PIC	9 (23.7)	5 (31.2)	0.5623
TIC	29 (76.3)	11 (68.7)	
<i>Cleft side</i>			
Right	18 (43.9)	7 (43.7)	0.9916
Left	23 (56.1)	9 (56.3)	

Chi-square Pearson

represented 54.76% of the sample, which is concordant with other published studies.^{7,8,12}

In this study, only patients with clefts involving the lip and alveolus, or lip, alveolus, and palate concomitantly were included. Therefore, only those patients with a PIC or TIC were examined. Of the selected patients, 21.43 and 78.57% had PIC and TIC respectively. Other studies have presented results ranging from 65.8 to 80.7% for TIC.^{12,14}

The TIC extends from the nose to the palate, leaving no bone in the region where corresponding teeth must erupt and 75.5% of unerupted teeth were included in this type of crack when compared with the preforamen clefts, while the canines correspond to 69.8% of the same. The results obtained in this study are similar to other published works.^{11,12,14}

In the areas corresponding to the cleft, there was no bone, but rather, an open cavity where most are missing soft tissue in the medial lower third of the face, especially reaching the nose, lip, and alveolus. This facial appearance becomes a stigma to those afflicted. Without the supporting bone, spontaneous dental eruption in this region would be difficult, and impacted or even absent teeth near the cleft are not uncommon.^{14,16} In the present study, impacted maxillary canines and lateral incisors were observed.

The lack of dental eruption 12 months after the alveolar bone graft surgery requires careful evaluation of imaging tests to establish the orthodontic traction of the impacted teeth.^{10,12,16-20}

Examining orthodontic traction by cleft type, all patients with a PIC, had natural, spontaneous eruption of their teeth following alveolar bone graft surgery. In contrast, orthodontic traction was required in all cases involving patients with a TIC. This is probably due to fact that in these clefts, the region devoid of bone tissue is greater, and the repair more extensive and time consuming. Similar results have been noted in the literature.²¹ It was considered significant (p = 0.0101), indicating the need for traction in most cases when patients have a TIC.

Table 4: Distribution of orthodontic traction according to the variables: gender, cleft type, and cleft side of patients with CLP

	Orthodontic traction		p-value
	Yes (%)	No (%)	
<i>Gender</i>			
Female	6 (42.9)	19 (47.5)	0.7642
Male	8 (57.1)	21 (52.5)	
<i>Cleft type</i>			
PIC	0 (0.0)	14 (35)	0.0101
TIC	14 (100)	26 (65)	
<i>Cleft laterality</i>			
Right	4 (28.6)	21 (52.5)	0.1222
Left	10 (71.4)	19 (47.5)	
<i>Impacted teeth</i>			
Maxillary canines	9 (64.3)	29 (72.5)	0.5523
Lateral incisors	5 (35.7)	11 (27.5)	

Chi-square Pearson

According to the literature, for cases in which there is involvement of the alveolar ridge, secondary bone graft surgery is to be performed after 7 years of age in the presence of impacted incisors.²² Other authors, however, contend that the same procedure should occur at 8 or 9 years of age, on the condition that the maxillary canine has formed two-thirds of its root.^{17,21} Contrary to that view, another author's work indicates that the amount of root formed would not affect the results of the dental eruption.²³ Early secondary bone grafting should be performed between the ages of 5 and 7 years to promote the eruption of the lateral incisor.²⁴ In the literature, the average age for bone graft surgery was 11.5 years. The time for the secondary bone grafting is very important for proper alignment of the teeth adjacent to the cleft, and depending on the treatment plan, it can be critical to include the lateral incisors for the optimal esthetic and functional restoration of the patient's teeth. It is believed that the bone graft needs to be anticipated, considering the root of the lateral incisor and not the canine root, in order for the lateral incisor eruption to maintain the bone graft in place, thus allowing further eruption of the canine tooth.^{13,14,16,22}

In the present study, the presence of secondary bone grafting contributed to the spontaneous eruption of most retained lateral incisors in the area of the cleft. As follows, the authors declare that this clinical procedure should be performed early, considering the formation of the root of the incisor and not the root of the canine.^{10,17,24}

CONCLUSION

- The TIC was the most frequent between the craniofacial anomalies and males were the most affected.
- The canine teeth were more frequently impacted and were associated with the TIC.
- Patients with a PIC had all teeth erupt spontaneously after placement of the alveolar bone graft.

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