

The selective grinding prosthetic feeding aid frequency influence towards premaxilla position on infant with complete unilateral cleft lip and palate



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Abstract

Objective: The purpose of the research was to analyze the influence of selective grinding frequency towards premaxilla position of infant with complete unilateral cleft lip and palate using prosthetic feeding aid.

Material and Methods: Ten infants with complete unilateral cleft lip and palate with wide alveolar cleft and rotating position of premaxilla were treated with prosthetic feeding aid. Impression was done twice to each subject before and after prosthetic feeding aid placement. The photograph was taken from each working model. Tracing was made on each photograph using photoQuad program on the assigned postulate spots. Adjustment towards the prosthetic feeding aid device was done every two week with selective grinding on the anatomical surface of acrylic on the palatolateral major and anteromedial minor defects,

and relining with soft liner on the labial of anatomical surface was also done. Anatomical surface selective grinding was not exceeded 1–1.5 mm on every visit. The correlation analyze between selective grinding frequency of prosthetic feeding aid and premaxilla position used the Pearson correlation coefficient.

Results: The correlation analysis between selective grinding prosthetic feeding aid frequency with premaxilla position on infant with complete unilateral cleft lip and palate have positive correlation with value of 23% or $r=0.479$ and $t\text{-count}=1.544$ or $p\text{-value}=0.1611$.

Conclusion: The more frequent the selective grinding on prosthetic feeding aid, the higher the premaxilla position change will increase towards midsagittal.

Keywords: Complete unilateral cleft lip and palate, Selective grinding, Prosthetic feeding aid, Premaxilla position

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Introduction

Complete unilateral cleft lip and palate is a condition where lips and palate are not perfectly merged in one side so there is a distance between both sides. Complete unilateral cleft lip and palate involves a hard palate, soft palate, alveolar ridge and lip on one side.¹ Maxilla segment on complete unilateral cleft lip will split into two parts, minor segment on the clefted side and major segment on the unclefted side.^{1,2}

Infant with complete unilateral cleft lip and palate has an asymmetry face caused by deviation from the nasal tip. The nasal tip is deformed and becomes flat. Besides that, the premaxilla will rotate to the outside.^{2,3} The minor segment of maxilla will experience a hypoplastic and retroposition, furthermore philtrum and columella will be retracted on one side and tilted on the unclefted side. The orbicularis oris muscle is disconnected on the cleft lip area. The ala nasi on the unclefted side will be concaved and pulled horizontally.²⁻⁴

Infant with cleft lip and palate will experience difficulties to get nutrition because of the unclefted anatomy structure, which is why the prosthetic feeding aid (PFA) construction is needed. The PFA is a device that is used for the patient before the cleft

unification surgery. The advantage of PFA are the reduction of cleft width, palate stimulation growth, increase of the maxilla curve growth, increase of the face and infant growth, increase of the occlusion, breast milk feeding, speaking, and hearing growth, the oral cavity tissue development and growth, and maintain the tongue in a good position.^{2,5}

The Plat Hotz is a passive type orthopedic plat that aligns the cleft segment with the help of extra-oral strapping and the use of plaster slowly. This device was made from the combination of hard and soft acrylic. It covers the alveolar segment passively and elongates/extends on the posterior part toward the uvula cleft tip. This plat gives a good adaptation in creating a normal swallowing pattern. It is used for 24 hours every day and it is only removed when it is cleaned.⁶

On the Kogo design, the 2 mm acrylic elevation was made on the posterior plat. The elevation plays a role in forming a close box. The Hotz-Kogo design modification is a combination from mechanical palatal posterior enhancement and elongation to the cleft on uvula where the design assimilation produces the maximum positive effect on the infant with cleft lip and palate.⁷

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Table 1 Complete unilateral cleft lip and palate research sample characteristic

Gender	Sample Group			
	Number		Age (days)	Weight (Kg)
	N	%	range	range
Male	3	30%	3–15	2.2–3.3
Female	7	70%	9–49	2.5–4.1
Amount	10	100%		

Table 2 The results of premaxilla angle measurements of infants with complete unilateral cleft lip and palate

Subject	Cleft Side	Treatment Beginning Age (days)	Labioplasty Reference Age	Selective Grinding Frequency	Premaxilla Position (in degree)	
					Before	After
1	Left	49	110	5	14.9	8.1
2	Right	10	72	2	26.3	26.2
3	Left	19	89	4	34.7	17.3
4	Left	15	117	7	17.1	12.7
5	Right	22	111	9	33.6	22.3
6	Left	9	97	5	12.8	9.5
7	Left	10	115	4	16.4	13.7
8	Left	3	108	4	17.2	13.7
9	Right	9	89	2	26.2	26
10	Left	15	140	6	23.3	14.5
Average					21.35	16.4

Table 3 Selective grinding prosthetic feeding aid frequency correlation with premaxilla position regression analysis

Selective Grinding Prosthetic Feeding Aid Frequency Correlation with Premaxilla Position Regression Analysis							
		r ²			0.230		
		Adjusted r ²			0.133		
		r			0.479		
		Std. Error			5.021		
		10			Observations		
		1			predictor variable		
		Premaxilla Position Change			is the dependent variable		
		Regression output			confidence interval		
variables	coefficients	std. error	t (df = 8)	p-value	95% Lower	95% upper	std. coeff.
intercept	0.0808	4.0597	0.020	.9846	-9.2808	9.4424	0.000
F	1.2019	0.7784	1.544	.1611	-0.5931	2.9969	0.479

Regression model cleft distance change:

$$Y_2 = 0,0808 + 1.2019 F$$

with:

$$Y_2 = \text{Premaxilla Position Change}$$

$$F = \text{Selective Grinding Prosthetic Feeding Aid Frequency}$$

coefficient analysis. **Figure 2** tracing was made on every sample photo using photoQuad program and linear measurement was made according to postulated spots which had been placed. An angular measurement was purposed to see the alveolar major segment's position measured from an angle that was formed by midsagittal field and line which was going through point I. The results were in degree units.

Results

Research was done to 10 infants with complete unilateral cleft lip and palate based on clinical examination including extra and intraoral diagnosis.

The research sample's characteristic; according to **table 1** of clinical examination and diagnosis covered 10 infants who filled the criteria. There were 3 male infants (30%) and 7 female infants (70%) with interval age between 3 and 49 days and interval weight between 2.8 and 4.1 kg.

Table 2 the average angle, maximum angle, and minimum angle of premaxilla before treatment were 21.35°, 33.6° and 12.8° respectively. After treatment, the average angle, maximum angle, and minimum angle decreased to 16.4°, 26.2° and 8.1° respectively. According to this result, the average number of premaxilla position decreased in amount of 4.85° after selective grinding prosthetic feeding aid.

Table 3 based on the Pearson's coefficient correlation analysis there was a positive correlation with value 23% or $r=0.479$ with t count=1.544 or p -value=0.611. The correlation was positive which means the more often selective grinding PFA, the premaxilla position change will increase otherwise, the lower frequency of selective grinding PFA resulted in smaller premaxilla position by changing of complete unilateral cleft lip and palate.

Discussion

On infant with complete unilateral cleft lip and palate, the upper jaw curve is divided into two segments: major segment and minor segment, and involving a soft palate, hard palate, and alveolar ridge.⁹ On this condition, the premaxilla segment is pushed more to the anterior. During development, the premaxilla will be more prominent and wide due to the muscle pull around the mouth when it functions.¹⁰

The research of Pollastri et al.¹¹ showed that the use of PFA to the patients with cleft lips and palates is playing a role in preventing maxilla segment shifted to the lateral and directing maxilla segment to the desired position. From the analysis

of the result, with the separating of the two maxilla segments and lip muscle, caused an imbalance of muscle that could pull on the tissue around infant's mouth. Furthermore, this caused rotation of maxilla segment, the asymmetry of nasal septum, and wider cleft.

The use of PFA will keep the maxilla segment unshifted when the muscle pulls. When periodically controlled, a selective grinding was done on the medial and palatal from major and minor segment. Also relining and soft liner addition on the anterior segment was done at the same time. These will cause the orthopedic force on the labial segment of the maxilla major and pushed the major segment towards palate. On the area where the selective grinding was done there was an empty space on the palatolateral that became a place where major segment was sliding. The selective grinding was done for 1–1.5 mm. According to Grayson et al.¹² the selective grinding should be done every week for 5 until 1 mm. In this research, the selective grinding was done every two weeks because of distance of patients' residence, and also due to cost and time consumption. The excessive selective grinding will affect the PFA retention, and too much pressure from relining and soft liner will cause injury to the tissue of oral mucosa.

The orthopedic force from relining will cause the premaxilla to return to its correct arch. After the premaxilla is in the correct arch and the major and minor maxilla segment gets closer, labioplasty can be done.

Conclusion

The more often selective grinding prosthetic feeding aid frequency, the higher the change of premaxilla position will increase heading to the right direction of midsagittal position.

Conflict of Interest

The authors report no conflict of interest.

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