Effects of Khon Kaen University Presurgical Nasoalveolar Molding Device on Maxillary Dimension in Complete Unilateral Cleft Lip and Palate Patients: A Full Protocol Evaluation

Prasongvaranon V Pisek P** Manosudprasit A** Punyavong P*** Manosudprasit A**.*

Abstract

A prior study reported on maxillary dentoalveolar changes post-application of the full Khon Kaen University Pre-surgical Nasoalveolar Molding device (KKU-PNAM) in complete unilateral cleft lip and palate patients. However, since the KKU-PNAM consists of three separate components, the individual effect of each part is still unclear. The purpose of this study is to determine maxillary dimensional changes after using KKU-PNAM at three time points. The researcher investigated 24 maxillary ridge casts taken from infants with complete unilateral cleft lip and palate were investigated after treatment with the KKU-PNAM at initial treatment (T1), two weeks (T2) and before cheiloplasty (T3). Landmark identification and direct measurements including alveolar cleft width, anterior arch width, mid-palatal cleft width, posterior arch width, anterior arch depth, total arch depth, arch circumference and midline deviation were solely performed by one experienced investigator. Intra-examiner reliability was verified via intraclass correlation (ICC). All measurements were normally distributed, with data analyzed via repeated measure ANOVA. The results showed that the average pre-treatment and post-treatment ages were 16.33±17.36 and 123.21±32.76 days respectively, with mean total treatment time at 105.29±33.98 days. Alveolar cleft width and midline deviation significantly reduced over time from T1 to T3 ($p<0.01$). Furthermore, arch circumference gradually increased among T1, T2 and T3 ($p<0.05$). There was no significant difference in anterior arch width, mid-palatal cleft width, posterior arch width, anterior arch depth and total arch depth at T2 and T3 ($p>0.05$). In conclusion, the severity of alveolar cleft was reduced significantly after the KKU-PNAM was applied at the first two weeks, as the labial taping's effect further decreased severity by addition of the contraction-screw plate until the point of primary lip surgery, thus improving the position of the maxillary alveolar ridge which brought out better outcomes prior to lip surgical correction.

***Keywords**: Unilateral cleft lip and palate/ Nasoalveolar molding device/ KKU-PNAM*

***Received:** September 24, 2019*
***Revised:** February 04, 2020*
***Accepted:** February 05, 2020*

Introduction

Current management for newborn cleft patients applied the use of presurgical nasoalveolar molding (PNAM) to correct deformities of the maxillary alveolus, nose, and columella prior to surgical lip repair.[1] There are various types of PNAM devices; presently, Grayson's technique is the most well-known approach. This technique incorporates an all-in-one design consisting of an elastic labial tape combined with an active acrylic plate and nasal stents.[2] However, the alveolar molding plate dislodges easily when the nasal stent is activated and its appearance gives the impression of being bulky[3].

The Khon Kaen University Presurgical Nasoalveolar Molding device (KKU-PNAM) was modified from Grayson's technique by Montian et al in 2012[3] (Figure 1). It comprises three independent components:1) an extraoral strapping to approximate alveolar segments together, 2) a forehead supported nasal molding device to correct nasal structures and 3) an active alveolar molding plate with traction screw to realign the maxillary segments into the optimal arch form position. Cleft patients are fitted with labial strapping and the nasal molding device at the initial treatment visit. In addition, an active molding plate with contraction screw is added two weeks post-treatment with the KKU-PNAM in order to align the maxillary segments. The KKU-PNAM device is applied until cleft patients are referred for cheiloplasty at approximately 3-4 months of age.

** Dental Hospital, Faculty of Dentistry, Khon Kaen University, Amphur Muang, Khon Kaen.*
*** Department of Preventive Dentistry, Faculty of Dentistry, Khon Kaen University, Amphur Muang, Khon Kaen.*
**** Department of Surgery, Faculty of Medicine, Khon Kaen University, Amphur Muang, Khon Kaen*

Figure 1 Khon Kaen University Presurgical Nasoalveolar Molding (KKU-PNAM)

A prior study was done by Wongpetch et al. in 2017[4] to study about the maxillary dentoalveolar changes after using the full KKU-PNAM appliance. Since the KKU-PNAM consists of 3 separate components, the effect of each part upon alveolar molding is unclear at the present. The aim of this study was to compare the dimensional changes of maxillary morphology following treatment with the KKU-PNAM in unilateral complete cleft lip and palate (UCLP) patients among three time points: initial treatment (T1), post application of the KKU-PNAM for 2 weeks (T2) and prior to cheiloplasty (T3).

Materials and Methods

Participants: Maxillary alveolar ridge casts were taken from 24 non-syndromic, healthy UCLP patients registered at the Department of Orthodontics, Khon Kaen Cleft Center between 2016 and 2018 after birth. Each series of casts were completely collected as per T1-initial treatment, T2-2 weeks, and T3-3 months post utilisation of the KKU-PNAM. The maxillary casts obtained from patients exhibiting incomplete UCLP, craniofacial anomalies, or whose parents failed to cooperate, were excluded from the study.

Procedure: According to the Khon Kaen Cleft Center's protocol (Figure 2), the impressions were collected on three occasions prior to primary lip surgery as follows; 1) initial treatment time - as a baseline record; T1, 2) the second visit - as a record after utilising the KKU-PNAM which consisted of an extraoral labial taping as well as a nasal molding device; T2 and 3) the third visit – post-use of the KKU-PNAM, in which a contraction-screw plate was added until the point of performing cheiloplasty; T3.

Measurements: Once maxillary alveolar casts were fabricated, nine reference landmarks were marked lightly on each cast with a 0.5-mm pencil by one experienced investigator. Linear measurements were done by the same researcher with a 0.01 mm-digital vernier caliper (ORTHO-DIRECT Mini Digital Vernier Caliper 53188, 190-1446, Dalian, China) (Figure 3).

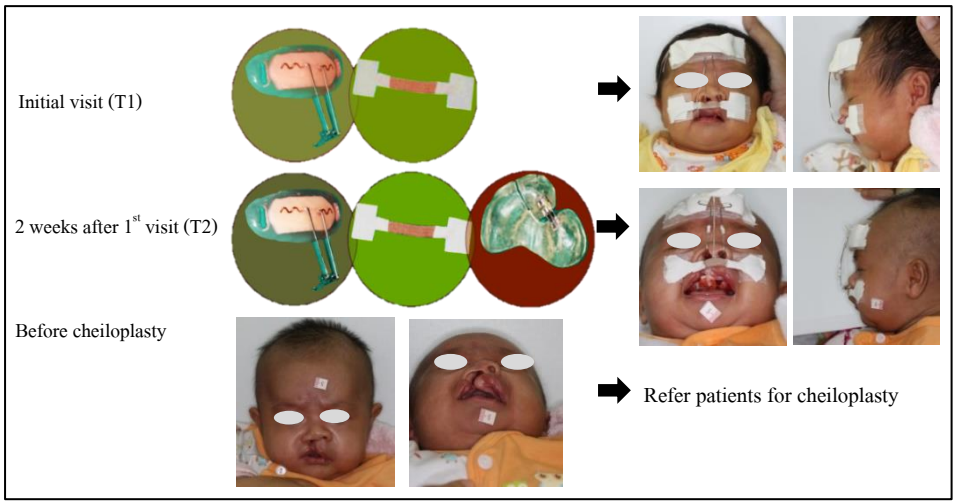

Figure 2 KKU-PNAM treatment protocol employed at Khon Kaen Cleft Center. Maxillary ridge casts were collected at three junctures: T1 - initial visit; T1 cast obtained. Nasal molding device and labial strapping inserted, T2 - 2 weeks following first visit; T2 cast obtained. Contraction-screw alveolar plate added and T3 – ahead of cheiloplasty; T3 cast obtained and patients referred for primary lip surgery.

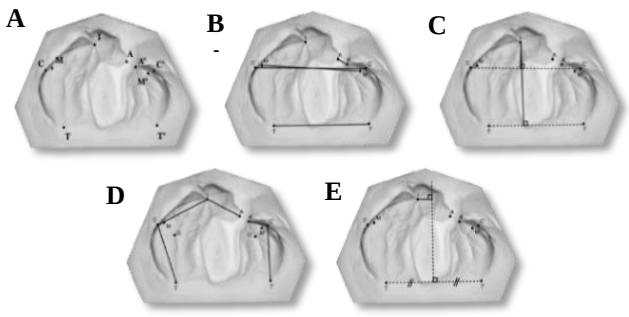

Figure 3 (A) Landmark identification. Linear measurements; (B) Distances were measured in transverse dimension including alveolar cleft width, anterior arch width, mid-palatal cleft width and posterior arch width (C) anteroposterior dimension i.e. anterior arch depth and total arch length (D) arch circumference and (E) midline deviation[4-7].

Definitions of the landmark identification and linear measurements on the maxillary casts are shown in Figure 3, Tables 1 and 2 respectively. Each maxillary cast was examined twice at 1 month-intervals so as to test the intra-observer reproducibility of landmark identification and linear measurements.

Statistical analysis: Means, standard deviations and 95% confidence intervals were applied amid data summarization. Repeated measure ANOVA was performed to analyze changes of maxillary morphology among T1, T2 and T3. To determine the mean differences among three groups, Bonferroni post hoc test was used. Furthermore, intraclass correlation coefficients (ICC) were employed to analyze intra-examiner reliability.

The current research was approved by the Institutional Ethical Committee approval for human research, Khon Kaen University (HE602319).

Table 1 Definition of reference landmarks on maxillary casts[4-7]

Reference points	Abbreviation	Definition
Alveolar cleft margin	A/A’	Midpoint of the alveolar margin of the greater/lesser segments
Canine point	C/C’	Intersection point between the lateral sulcus and the alveolar ridge of the greater/ lesser segments
Midpalatal cleft margin	M/M’	Intersection point between midpalatal cleft margin and a line connecting canine point and gingival groove point on greater/lesser segments
Tuberosity point	T/T’	Intersection point between the alveolar ridge and hamular sulcus of the tuberosity on greater/lesser segments
Incisal point	I	Intersection point between alveolar ridge and labial frenum

Table 2 Definition of linear measurements[4-7]

Linear variables	Abbreviation	Definition
Transverse dimension		
A-A’	ACW	Alveolar cleft width— Inter-alveolar cleft margin distance
C-C’	AAW	Anterior arch width— Intercanine distance
M-M’	MCW	Midpalatal cleft width— Inter-midpalatal cleft margin distance
T-T’	PAW	Posterior arch width— Intertuberosity distance
I perp.	MD	Midline deviation— Perpendicularly distance from incisal point to an imaginary midpalatal plane
Anteroposterior dimension		
I/A-A’	AD	Anterior arch depth— Perpendicularly vertical distance from incisal point to intercanine distance
I/T-T’	TAD	Total arch depth— Perpendicularly vertical distance from incisal point to intertuberosity distance
Arch circumference		
T-C-I-A-A’-C’-T’	AC	Total arch length— Sum of distances; T-C-I-A-A’- C’-T’ (AC)

Results

In total, 24 UCLP patients participated in the study: 11 males (45.8%) and 13 females (54.2%). Patients' average ages were at outset, completion of KKU-PNAM application and prior to lip surgery 16.33 ± 17.36 and 123.21 ± 32.76 days, respectively (Table 3). Moreover, mean total treatment time was 105.29 ± 33.98 days. Most patients demonstrated cleft site on the left side (19 patients, 79.2%) and only 5 patients (20.8%) exhibited cleft on the right side (Table 4).

The descriptive data pertaining to all liner measurements, including means, standard deviation and 95% confidence interval for mean, are demonstrated (Table 5). Mean treatment difference (diff), standard error (SE) and significance level of the linear measurements comparing among T1, T2 and T3 are shown (Table 6)

Table 3 Age and total treatment time among cleft patients

	Mean	Median	SD	Minimum	Maximum
Pretreatment age (days)	16.33	7.00	17.36	2	60
Posttreatment age (days)	123.21	114.00	32.76	74	204
Total treatment time (days)	105.29	104.00	33.98	26	165

Table 4 Affected sites among 24 UCLP patients in the present study

		Gender		Total
		Male	Female	
Cleft site	Right side	3 (12.5%)	2 (8.3%)	5 (20.8%)
	Left side	8 (33.3%)	11 (45.9%)	19 (79.2%)
Total		104.00	11 (45.8%)	13 (54.2%)

Table 5 Means, medians, standard deviations, minimum values, maximum values and 95% confidence interval for mean (in mm) of the linear measurements

Parameters	T1				T2				T3			
	Mean	SD	95% CI		Mean	SD	95% CI		Mean	SD	95% CI	
			L	U			L	U			L	U
ACW	10.98	2.33	10.00	11.97	8.00	2.41	6.98	9.01	4.75	2.66	3.63	5.87
AAW	34.38	4.18	32.61	36.14	34.30	4.78	32.28	36.32	34.16	5.46	31.85	36.46
MCW	30.60	3.78	29.01	32.20	29.90	4.07	28.18	31.62	28.88	5.03	27.75	32.00
PAW	32.37	2.37	31.37	33.37	32.35	2.87	31.14	33.57	33.12	3.04	31.84	34.41
AD	4.90	2.25	3.95	5.84	5.29	2.01	4.45	6.14	4.71	1.97	3.89	5.54
TAD	22.09	2.44	21.06	23.12	22.75	2.29	21.78	23.72	22.41	3.01	21.14	23.69
AC	64.12	6.75	61.27	66.97	67.43	7.17	64.41	70.46	70.64	8.05	67.25	74.04
MD	5.45	1.63	4.76	6.14	3.44	1.31	2.88	3.99	1.83	0.76	1.51	2.15

Table 6 Mean treatment difference (diff), standard error (SE) and significance level of the linear measurements as compared among T1, T2 and T3

Parameters	Bonferroni Post Hoc Comparisons								
	T1-T2			T2-T3			T1-T3		
	diff	SE	Sig.	diff	SE	Sig.	diff	SE	Sig.
ACW	2.99*	0.31	0.00	3.24*	0.43	0.00	6.23*	0.49	0.00
AAW	0.07	0.68	1.00	0.15	0.70	1.00	0.22	0.83	1.00
MCW	0.70	0.52	0.57	0.02	0.65	1.00	0.73	0.72	0.98
PAW	0.02	0.45	1.00	-0.77	0.56	0.55	-0.75	0.56	0.57
AD	-0.40	0.32	0.68	0.59	0.29	0.16	0.19	0.35	1.00
TAD	-0.66	0.38	0.28	0.34	0.43	1.00	-0.32	0.53	1.00
AC	-3.31*	0.90	0.00	-3.21*	0.98	0.01	-6.52*	1.17	0.00
MD	2.01*	0.19	0.00	1.61*	0.20	0.00	3.62*	2.49	0.00

* Statistically significant at p-value < 0.05

For landmark identification, intra-examiner reliability was excellent (Cronbach's alpha coefficiency = 0.928-0.997) with no differences observed between two sessions (p-value<0.01). Whereas, for the reproducibility of linear measurements, the intra-examiner reliability was almost perfect (ICC>0.871).

Having applied the KKU-PNAM among patients, alveolar cleft width was significantly decreased over time from T1 (10.98±2.33 mm; 95% CI 10.00, 11.97) to T2 (8.00 ± 2.41 mm; 95% CI 6.98, 9.01) at p-value 0.00. What's more, alveolar cleft width additionally reduced to 4.75±2.66 mm (95% CI 3.63, 5.87) at T3 (p<0.01) ahead of cheiloplasty referral. As for midline deviation, the incisal point which deviated from the imaginary maxillary midline, was initially 5.45±1.63 mm (95% CI 4.76, 6.14) at T1. After labial taping and contraction-screw plate, the incisal point significantly moved toward the midline, i.e. 3.44±1.31 mm (95% CI 2.88, 3.99) and 1.83±0.76 mm (95% CI 1.51, 2.15) at T2 and T3 respectively (p<0.01).

In contrast, arch circumference increased among the three time periods (p<0.05). Average arch circumference significantly increased by 3.31 mm from T1 (64.12±6.75 mm; 95% CI 61.27, 66.97) to T2 (67.43±7.17 mm; 95% CI 64.41, 70.46). At T3, arch circumference additionally increased by 3.21 mm to 70.64±8.05 mm (95% CI 67.25, 74.04) at p-value 0.00. What's more, there were non-significant mean differences in anterior arch width, midpalatal cleft width, posterior arch width, anterior arch depth and total arch depth at both T1-T2 and T2-T3 periods.

Discussion

The Khon Kaen Cleft Lip and Palate Center demonstrates a uniquely designed pre-surgical orthopedic modality known as the Khon Kaen University Pre-surgical Nasoalveolar Molding device (KKU-PNAM) as modified by Montian et al, 2012.[3] The KKU-PNAM incorporates three independent components:[3-4] an extraoral labial strapping, a forehead supported nasal molding device and a contraction-screw molding plate. Compared to Grayson's device, the KKU-PNAM is smaller, and therefore, does not interfere with normal infant feeding. Moreover, it provides improved retention due to its independent parts. In a recent study, a nasal molding device and an extraoral labial strapping were inserted at the first two weeks without an active contraction plate. This design was similar to Monasterio's et al; nasal elevator plus DynaCleft®[8] and Abdiu's et al; nasal alar elevator and labial tape.[9] Meanwhile, the design of the full KKU-PNAM which encompasses three active components is similar to Doruk's device known as an Extraoral Nasal Molding Appliance or ENMA.[10] Nevertheless, the tip of the nasal stent among these appliances[8-10] provides less flexibility; i.e. a single hook is used to elevate the cleft site only. Furthermore, the tip of the KKU-PNAM nasal molding part is a kidney-shaped acrylic resin piece attached to an adjustable coiled spring providing a gentle activating force. In addition, it is composed of 2 wires attached to the acrylic adhered to the forehead. This enables it to apply force, elevate the collapsed nasal aperture and also enhance nasal symmetry according to the wire on the non-effected side which acts as a supporting part to guide the nostril approaches to the same level.

The primary objective of the study was to determine the effectiveness of the KKU-PNAM on the maxillary alveolar cleft. A prior study performed by Wongpetch et al. in 2017[4] which evaluated maxillary dentoalveolar changes post-utilisation of the full KKU-PNAM, compared two time junctures: at initiation and at therapy completion. Meanwhile, our investigation incorporated a greater number of participants at three points in time as per treatment protocol used by the Khon Kaen Cleft Center: initial visit, two weeks post-treatment and prior to primary lip correction. Comparisons made between maxillary morphology, alveolar cleft width and midline deviation were significantly similar. Non-significant findings in relation to maxillary morphology were found amid both transverse and anteroposterior dimensions in the recent study. However, the study above reported significantly decreasing arch length values.[4] This might be due to the fact that they measured from the alveolar margin of greater segments perpendicular to inter-tuberosity distance. In contrast, incisal point was used instead in our study as representation of the middle part of the premaxilla. Moreover, we revealed that arch circumference increased as

expected amid infantile growth; yet a slight decreasing effect was reported in Wongpetch's study.

Additionally, numerous previous studies support our findings in that alveolar cleft width reduced significantly post-NAM, in spite of the differing nasoalveolar molding device designs including Latham device,[11] passive plate,[5] Hotz plate,[12] physio tape therapy,[13] nasal elevator plus DynaCleft®[8] and ENMA.[10] On the contrary, one study carried out in the United Kingdom[7] reported no significant changes in alveolar cleft width when applying a pre-surgical orthopedic plate with a U-shaped spring and split overlapping shelves; this may be due to labial strapping not being utilised in their study. In this study, arch circumference showed a significant increased effect post-KKU-PNAM therapy ($p<0.01$) in correlation with Sabarinath's study.[6] On the other hand, some previous studies observed an insignificant change of arch circumference compared to before and after NAM treatment.[5,7] Midline deviation exhibited a significantly reducing variable as an incisive papilla moved inward closely to the maxillary midline following KKU-PNAM therapy amid all junctures ($p<0.01$) as consequently supported by two previous studies.[4,6]

Non-significant mean difference of anterior arch width, midpalatal cleft width, posterior arch width, anterior arch depth and total arch depth were discovered among three different points in time. Three previous studies reported agreeable results in terms of anterior arch width, mid-palatal cleft width, posterior arch width, anterior arch depth and total arch depth[5-7] despite the application of different appliances. This may imply that maxillary outward growth might be inhibited by a pre-surgical alveolar molding plate. Nevertheless, inadequate evidences regarding normal maxillary growth in newborns are not yet available to confirm this observation.

Labial taping therapy has been employed as a pre-surgical orthopedic therapy in cleft patients for centuries as the simplest approach.[14-15] To achieve a proper activation force of approximately 2 ounces, an elastic tape should be stretched over the upper lip twice its initial length.[16] A case report in South Africa stated that physio-taping therapy alone was able to reduce cleft angle in eight patients.[13] In the present study, almost half of all initial alveolar cleft widths were statistically significantly reduced over T1-T2 period as per the first two-week effect of labial strapping combined with a nasal molding device ($p<0.01$) which conformed to one previous study.[8] Over half of the cleft defects at T2 further significantly decreased as per the full effect of the KKU-PNAM until T3 ($p<0.01$), as one study reported.[4] Another previous study revealed no significant difference in the effectiveness between nasal elevator plus DynaCleft® and NAM-Grayson appliance on maxillary morphology.[8] Consequently, the T1-T2 period in our study correlates with the use of Dynacleft,® and the T2-T3 period seem to represent the employment of the NAM-Grayson method. Additionally, all parameters from our results changed in the same way during these periods. Based on Monasterio's findings, an active alveolar plate appears unnecessary in regards to closing the alveolar cleft gap. Nevertheless, it would be difficult to control the movement of the greater and lesser segments in order to achieve a homogenous arch form. Moreover, our outcome of a significantly decreasing midline deviation demonstrated that an incisive papilla moved to the midline after T3. Therefore, the contraction-screw alveolar plate is an important component of the PNAM to establish a well-aligned arch.

Outset points among subjects were somewhat diverse in this study; the earliest pre-treatment juncture began at 2 days of age as patients were referred from Srinagarin Hospital within the first week after birth to receive KKU-PNAM therapy; whereas some treatment was delayed due to patients coming from rural areas as well as other provinces. As described in the KKU protocol, the cleft patient should be achieved in rules of ten at approximately 3-4 months prior for surgical procedure without the hazardous effect of general anesthesia. Moreover, seen as clinically beneficial, this period prevents the loss of parent-child bond as early as possible.[17] Accordingly, the more treatment is delayed, the shorter the treatment time available to patients which, as a consequence, leads to undesirable outcomes.

The potential factors affecting the accuracy of landmark identification and linear measurements are maxillary alveolar anatomical structures during infancy, quality of maxillary ridge casts, and the accuracy of the measuring instrument, as well as the examiner's experience. Maxillary gum pads appear as a continuously curved ridge connecting to the palatal shelves without distinguished borders as demonstrated by each structure. Therefore, landmark identification and linear measurements can be difficult to locate and it can be challenging to reproduce those reference points precisely. Likewise, poorly detailed impressions and casts, a non-experienced investigator, or unqualified measuring instruments may also act as hindrances. Regarding this study, the investigator was a well-trained orthodontist and the intra-examiner reliability indicates substantial reproducibility. Besides that, a digital vernier caliper provides two decimal positions to the measured values.

The current study was a short-term investigation of the KKU-PNAM and its effect on maxillary alveolar cleft ridge. Long-term evidence is needed to further evaluate the effectiveness of the appliance; yet the longer the follow-up, the more confounding factors might be found, such as surgery technique and complications, scar contraction and child growth. A randomized prospective clinical trial investigation of the KKU-PNAM device compared with a negative control group is also required to affirm the effectiveness of the KKU-PNAM device amid maxillary morphology which again, ought to be considered for future study.

Conclusion

The severity of the alveolar cleft width was reduced significantly, post-application of the KKU-PNAM device among cleft patients. At the first two weeks, the labial taping's effect played a major role. Later, cleft defects progressively decrease as the combination effects of the labial tape and a contraction-screw alveolar plate until the occasion of primary lip surgery.

The KKU-PNAM device not only decrease alveolar cleft gap, it also improved the position of the maxillary segments, hence allowing for improved outcomes prior to surgical lip correction.

Pre-surgical orthopedic therapy accompanied by the KKU-PNAM device, thus, ought to be begun as early as possible.

Acknowledgement

This study was supported by a grant from The Center of Cleft Lip-Cleft Palate and Craniofacial Deformities, Khon Kaen University under the Tawanchai Royal Grant Project. The research was carried out in collaboration between the Division of Orthodontics, Department of Preventive Dentistry, Faculty of Dentistry and Department of Surgery, Faculty of Medicine, Khon Kaen University.

References

1. Spengler AL, Chavarria C, Teichgraeber JF, Gateno J, Xia JJ. Presurgical nasoalveolar molding therapy for the treatment of bilateral cleft lip and palate: a preliminary study. Cleft Palate Craniofac J 2006;43(3):321-8.
2. Grayson BH, Santiago PE, Brecht LE, Cutting CB. Presurgical nasoalveolar molding in infants with cleft lip and palate. Cleft Palate Craniofac J 1999;36(6):486-98.
3. Manosudprasit M, Chongcharueyskul P. Presurgical Nasoalveolar Molding Techniques for a Complete Unilateral Cleft Lip and Palate Infant: A Case Report. J Med Assoc Thai 2015;98(7):S234-42.
4. Wongpetch R, Manosudprasit M, Pitiphat W, Manosudprasit A, Manosudprasit A. Dentoalveolar Changes after using nasoalveolar molding device in complete unilateral cleft lip and palate patients. J Med Assoc Thai 2017; 100(8):S117-22.
5. Prahl C, Kuijpers‐Jagtman AM, Van'T Hof MA, Prahl‐Andersen B. A randomised prospective clinical trial into the effect of infant orthopaedics on maxillary arch dimensions in unilateral cleft lip and palate (Dutchcleft). Eur J Oral Sci 2001;109(5):297-305.

6. Sabarinath V, Thombare P, Hazarey P, Radhakrishnan V, Agrekar S. Changes in maxillary alveolar morphology with nasoalveolar molding. J Clin Pediatr Dent 2010; 35(2):207-12.
7. Adali N, Mars M, Petrie A, Noar J, Sommerlad B. Presurgical orthopedics has no effect on archform in unilateral cleft lip and palate. Cleft Palate Craniofac J 2012;49(1):5-13.
8. Monasterio L, Ford A, Gutiérrez C, Tastets ME, García J. Comparative study of nasoalveolar molding methods: nasal elevator plus DynaCleft® versus NAM-Grayson in patients with complete unilateral cleft lip and palate. Cleft Palate Craniofac J 2013;50(5):548-54.
9. Abdiu A, Ohannessian P, Berggren A. The nasal alar elevator: A new device that may reduce the need for primary operation of the nose in patients with cleft lip. Scand J Plast Reconstr Surg Hand Surg 2009;43(2):71-4.
10. Doruk C, Kiliç B. Extraoral nasal molding in a newborn with unilateral cleft lip and palate: a case report. Cleft Palate Craniofac J 2005;42(6):699-702.
11. Smith KS, Henry BT, Scott MA. Presurgical dentofacial orthopedic management of the cleft patient. Oral Maxillofacial Surg Clin N Am 2016;28(2):169-76.
12. Awasthi P, Thahriani A, Bhattacharya A. Nasoalveolar morphology following presurgical orthopedic treatment in unilateral cleft lip alveolus and palate infants. Int J Dent Med Spec 2016;3(1):6-11.
13. Dawjee S, Julyan J, Krynauw J. Lip tape therapy in patients with a cleft lip-a report on eight cases: clinical communication. S Afr Dent J 2014;69(2):62-9.
14. Grayson BH, Shetye PR. Presurgical nasoalveolar moulding treatment in cleft lip and palate patients. Indian J of Plast Surg 2009;42(Suppl):S56-61.
15. Berggren A, editor Surgical tape and the nasal alar elevator—two simple and useful tools in the early preoperative treatment of cleft lip patients. International Congress of cleft lip-palate and craniofacial Anomalies; 2001.
16. Grayson BH, Maull D. Nasoalveolar molding for infants born with clefts of the lip, alveolus and palate. Clin Plast Surg 2004;31(2):451-8.
17. Manosudprasit M, Wangsrimongkol T, Pisek P, Wiwatworakul O. Pre-surgical nasoalveolar molding technique: a literature review. J Med Assoc Thai 2014; 97(10): S17-24.

Corresponding Author

Aggasit Manosudprasit
Department of Preventive Dentistry,
Faculty of Dentistry, Khon Kaen University,
Amphur Muang, Khon Kaen, 40002.
Tel.: +66 4320 2405 #45147
Fax.: +66 4320 2862
Email: agg441@hotmail.com

ผลของเครื่องมือปรับแต่งจมูกและสันเหงือกก่อนการทำศัลยกรรมของมหาวิทยาลัยขอนแก่นต่อรูปร่างสันเหงือกบนในผู้ป่วยปากแหว่งเพดานโหว่ด้านเดียวโดยสมบูรณ์: การประเมินตามระเบียบการโดยสมบูรณ์

วริษนันท์ ประสงค์วรานนท์ พูนศักดิ์ ภิเศก** อมรรัตน์ มโนสุดประสิทธิ์***
*ปัทมา ปัญญาวงศ์*** เอกสิทธิ์ มโนสุดประสิทธิ์***

บทคัดย่อ

การศึกษาก่อนหน้ามีการรายงานการเปลี่ยนแปลงรูปร่างสันเหงือกบนหลังจากใช้เครื่องมือปรับแต่งจมูกและสันเหงือกก่อนการทำศัลยกรรมของมหาวิทยาลัยขอนแก่นในผู้ป่วยปากแหว่งเพดานโหว่ด้านเดียวโดยสมบูรณ์ เนื่องด้วยเครื่องมือดังกล่าวประกอบด้วยองค์ประกอบสามส่วนที่แยกจากกัน ผลการรักษาเฉพาะส่วนยังไม่เป็นที่ชัดเจน จึงเป็นที่มาของการวิจัยเพื่อศึกษาการเปลี่ยนแปลงรูปร่างสันเหงือกบนภายหลังจากใช้เครื่องมือดังกล่าว ผู้วิจัยทำการวิจัยแบบจำลองสันเหงือกบนของทารกปากแหว่งเพดานโหว่ด้านเดียวโดยสมบูรณ์ทั้งหมด 24 คนภายหลังการใช้เครื่องมือปรับแต่งจมูกและสันเหงือกก่อนการทำศัลยกรรมของมหาวิทยาลัยขอนแก่น ณ ก่อนการรักษา (T_1) ภายหลังการใส่เครื่องมือสองสัปดาห์ (T_2) และก่อนเย็บริมฝีปากบน (T_3) ผู้วิจัยซึ่งมีประสบการณ์คนเดียวทำการกำหนดจุดอ้างอิงและวัดค่าต่างๆ โดยตรง ได้แก่ ความกว้างช่องโหว่สันเหงือก ความกว้างสันเหงือกด้านหน้า ความกว้างสันเหงือกกึ่งกลางเพดาน ความกว้างสันเหงือกด้านหลัง ความยาวสันเหงือกด้านหน้า ความยาวสันเหงือกทั้งหมด ความยาวโค้งสันเหงือก และ ความเบี่ยงเบนเส้นกึ่งกลางสันเหงือก ความน่าเชื่อถือของผู้วิจัย (Intra-examiner reliability) ตรวจสอบด้วยสัมประสิทธิ์สหสัมพันธ์ (Intraclass correlation; ICC) ทุกค่ามีการกระจายข้อมูลปกติ ข้อมูลจึงถูกวิเคราะห์ด้วยการวิเคราะห์ความแปรปรวนเมื่อมีการวัดซ้ำ (repeated measure ANOVA) ผลการศึกษาพบว่าอายุเฉลี่ยก่อนและหลังการรักษาเท่ากับ 16.33±17.36 และ 123.21 ±32.76 วัน ตามลำดับ ระยะเวลาการรักษาทั้งหมด 105.29±33.98 วัน ค่าความกว้างช่องโหว่สันเหงือก และความเบี่ยงเบนเส้นกึ่งกลางสันเหงือกลดลง (6.23 ± 0.49 และ 3.62±2.49 มิลลิเมตรตามลำดับ) อย่างมีนัยสำคัญจาก T1 ถึง T3 ($p = 0.00$) นอกจากนี้ความยาวโค้งสันเหงือกค่อยๆ เพิ่มขึ้นในช่วงระหว่าง T1, T2 และ T3 ($p<0.05$) (6.52±1.17 มิลลิเมตร) ไม่พบความแตกต่างอย่างมีนัยสำคัญทางสถิติในค่าความกว้างสันเหงือกด้านหน้า ความกว้างสันเหงือกกึ่งกลางเพดาน ความกว้างสันเหงือกด้านหลัง ความยาวสันเหงือกด้านหน้า และความยาวสันเหงือกทั้งหมด ณ T2 และ T3 ($p>0.05$) จากการศึกษาสรุปได้ว่าความรุนแรงของช่องโหว่สันเหงือกบนลดลงอย่างมีนัยสำคัญภายหลังใช้เครื่องมือปรับแต่งจมูกและสันเหงือกก่อนการทำศัลยกรรมของมหาวิทยาลัยขอนแก่นสองสัปดาห์แรกเป็นผลมาจากผ้าคาดปาก (labial taping) และความรุนแรงลดลงเพิ่มขึ้นโดยใช้เพดานเทียมร่วมกับสกรูชนิดหดตัว (contraction-screw plate) เพิ่มเติมจนกระทั่งผู้ป่วยเย็บริมฝีปากบน ดังนั้นตำแหน่งสันเหงือกบนที่ดีขึ้นทำให้การผลการรักษาก่อนการผ่าตัดได้ผลลัพธ์ที่ดีขึ้น

คำไขรหัส: *ปากแหว่งเพดานโหว่ด้านเดียวโดยสมบูรณ์/ เครื่องมือปรับแต่งจมูกและสันเหงือก/ เครื่องมือปรับแต่งจมูกและสันเหงือกก่อนการทำศัลยกรรมของมหาวิทยาลัยขอนแก่น*

ผู้รับผิดชอบบทความ

เอกสิทธิ์ มโนสุดประสิทธิ์
สาขาวิชาทันตกรรมป้องกัน คณะทันตแพทยศาสตร์
มหาวิทยาลัยขอนแก่น อำเภอเมือง จังหวัดขอนแก่น 40002
โทรศัพท์: 0 4320 2405 #45147
โทรสาร: 0 4320 2862
จดหมายอิเล็กทรอนิกส์: agg441@hotmail.com

** โรงพยาบาลทันตกรรม คณะทันตแพทยศาสตร์ มหาวิทยาลัยขอนแก่น อำเภอเมือง จังหวัดขอนแก่น*
*** สาขาวิชาทันตกรรมป้องกัน คณะทันตแพทยศาสตร์ มหาวิทยาลัยขอนแก่น อำเภอเมือง จังหวัดขอนแก่น*
**** ภาควิชาศัลยศาสตร์ คณะแพทยศาสตร์ มหาวิทยาลัยขอนแก่น อำเภอเมือง จังหวัดขอนแก่น*