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Evaluation of posterior cleft width changes after using acrylic nasoalveolar molding devices in patients with unilateral cleft lip and palate

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Abstract: Background: Objectives: the aim of this study was to evaluate the changes occurred in posterior cleft width in unilateral cleft lip and palate patients after utilizing acrylic nasoalveolar molding device

Materials and methods: ten patients with unilateral cleft lip and palate were treated with acrylic nasoalveolar molding device. Maxillary dental models were scanned at two points of time S0 (before treatment) S1 (after finishing the treatment) these models were used to asses changes in posterior cleft width using software.

Results: the use of acrylic nasoalveolar molding showed statistically significant reduction in posterior cleft width in patients with unilateral cleft lip and palate

Conclusion: Nasoalveolar molding treatment aims to improve the position of maxillary alveolar segments. Acrylic nasoalveolar molding devices showed acceptable results regarding posterior cleft width reduction after treatment which led to better surgical correction

Keywords: cleft, acrylic, nasoalveolar molding device

Introduction

It is estimated that 1 in 700 live newborns will have cleft lip and palate; in Egypt, the prevalence is 0.3/1000.First of all Roughly half of all oral clefts (46%) involve both the lip and the palate, while simply the palate accounts for 33% of clefts and the lip alone for 21%.(1)

Males are more likely than females to have CL/P, and they are more frequently unilateral than bilateral. The left side experiences unilateral defects more frequently than the right. (2)

Reducing the severity of the original cleft deformity is the main goal of presurgical nasoalveolar molding (NAM). This makes it possible for both the patient and the surgeon to benefit from the correction of a minimally severe cleft malformation.(3)

The goal of NAM is to lessen the cleft's severity (cleft size, nasal deformity, and other deformities which will enhance the outcome of subsequent surgeries, lessen the need for lip and nose revisions, and leave less scarring. It has been demonstrated that NAM greatly enhances nasal symmetry over the short (3 months to 1 year) and long (3 to 12 years) terms**.**

It is best to handle cleft patient care as a multidisciplinary team. Due to improved surgical techniques, scheduling, and integration of presurgical orthopedics, it has seen a significant evolution in recent years. The restoration of normal anatomy is the main goal of treatment. Over the last ten years, it has been apparent that in these individuals, the shape of the alveolar process can be combined with nonsurgical columella lengthening and correction of nasal abnormalities through elongation of the nasal mucosal lining. (5)

Presurgical nasoalveolar molding (PNAM) is a non-surgical technique used to reduce the severity of the cleft by sculpting the lips, nostrils, and gums before CLP surgery. Before the idea of NAM was developed, treating a large cleft required multiple surgeries to be performed on the child between the time of birth and the age of eighteen, which put the youngster at risk for mental and social adjustment disorders. Better outcomes can be achieved with just one or two surgeries thanks to the development of PNAM, which eliminates the need for several surgical procedures. [6]

When compared to other presurgical orthopedic procedures, the nasoalveolar molding approach has been demonstrated to considerably improve the surgical result of the main repair in individuals with cleft lip and palate.

Materials and methods:

The present research project was carried out in Egypt. The ethical committee of Minia University's Faculty of Dentistry evaluated the study and gave it their approval. Furthermore, the entire process was watched carefully.

Participants

The investigation involved ten nonsyndromic neonates with unilaterally cleft lip and palate. The prosthodontics department of Minia University in Egypt's Faculty of Dentistry was the location of the study.

Inclusion and exclusion criteria

The newborns in this study were of both genders, younger than one month old, and had unilateral non-syndromatic cleft lip and palate; any other cases were not included in the research.

Intervention

After receiving a new baby at S0 (prior to starting any kind of therapy) the baby's maxillary arch was first imprinted using impression compound (HIFLEX impression compositions, Prevest compound, India). The imprint was then poured to create an initial model, which was used to construct a special tray for the purpose

of taking a secondary impression using silicone material that condensed (i-Dental i-MPRESS Condensation Silicone Material, Lithuania)

Finally, the imprint was poured to create a final cast, which was used to construct an acrylic nasoalveolar molding device. The device was composed of clear acrylic resin that had been heat-cured (Acrostone, Heat cured resin, El salam city, Gamal Abd El Nasser str, Tel 6242101, Egypt)

Additionally, this cast was scanned to create a digital model that was utilized for assessing modifications to the maxillary arch.

The resulting nasoalveolar molding device was adjusted to ensure that the mucosa would not be as irritated.

Parents were asked to continuously wear the nasoalveolar molding device on their infant, and the holding arm was positioned to allow for tape fixation. The infants were recalled once a week to check on treatment progress and adjust the devices.

Another impression was obtained after completing the treatment before surgery (after 3 months S1) the impression was used to obtain final model which was scanned with primary model obtained at S0 (before any treatment)

Scanning wad made using desk top scanner (MDS500 3D Dental Scanner)

The obtained virtual models in Stereo lithographic format were imported into a three-dimensional (3D) CAD software program (ver. 17.0, Mimics; Materialise, Leuven, Belgium) for measurements.

Two anatomical points were defined and marked on the digital models according to Börnert H. (7)

Posterior cleft points (greater segment GS/ Lesser segment LS) (P/P'): Intersection of the alveolar cleft margin with the plane that connecting the tuber points and perpendicular to the alveolar crest.fig.1

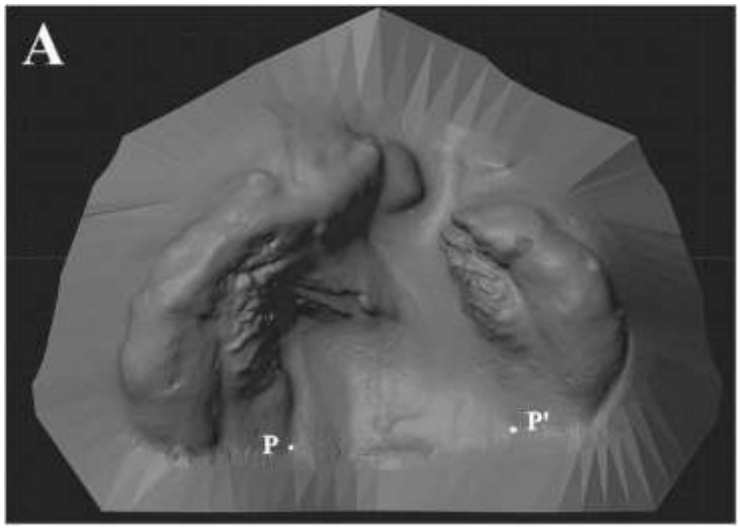

Figure 1: Positioning of landmarks for the measurement of alveolar changes after nasoalveolar molding in infants with unilateral cleft lip and palate

Results:

Data were presented as mean, standard deviation (SD), median and range values

Posterior cleft width data which are non-normal (non-parametric) data

For non-parametric data, Mann-Whitney U test was used to compare between the two groups. The significance level was set at P ≤ 0.05

Results showed that before treatment Mean value was 8.67 and Standard Deviation was 1.33 while after treatment Mean value was 7.26 there and Standard Deviation was 1.20. There was a statistically significant decrease in posterior cleft width after treatment and (P-value <0.001, Effect size = 0.248)

Table: Descriptive statistics and results of repeated measures ANOVA test for comparison between posterior cleft width (mm) in the two groups and the changes within each group

Time	Conventional Acrylic NAM (n = 10)		*P*-value
	Mean	SD	
Before treatment	8.67	1.33	0.456
After treatment	7.26	1.20	0.153
P-value	<0.001*		
Effect size (Partial Eta squared)	0.248		

**: Significant at P ≤ 0.05*

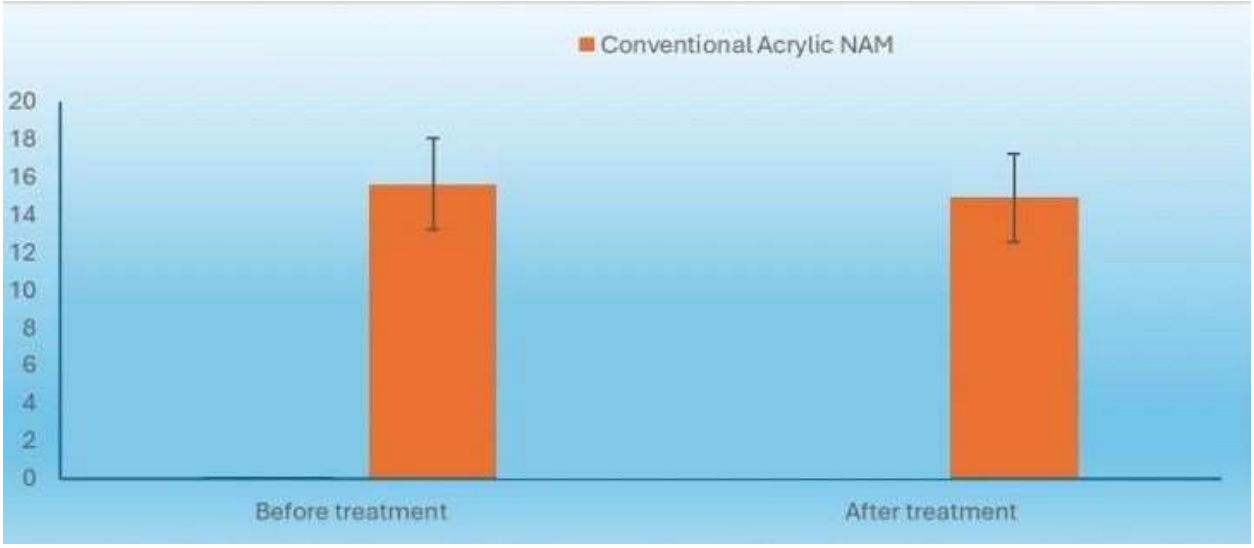

Figure 2: Bar chart representing mean and standard deviation values for posterior cleft width measurements

Discussion

Worldwide, there are roughly 1.5 occurrences of cleft lip and palate (CLP) for every 1000 live births, or 250,000 new cases annually. They may be bilateral or unilateral, complete or incomplete (8, 9).

Because of the complicated etiology, potential morbidity, and significant multidisciplinary commitment needed for intervention and therapy, CLP is a significant public health concern (10, 11).

Due to a lack of connective tissue, a unilateral cleft lip and palate manifests as a split lip and changed nasal form. The nose is drawn to the unaffected side, the columella on the cleft side is shortened, the nasal base is enlarged, and the lateral cartilage is pushed to a more lateral position. (12)

Nasoalveolar shaping, a nonsurgical method, is a viable therapeutic option for individuals with unilateral or bilateral cleft lip and palate. Depending on which side is affected, these congenital craniofacial anomalies can cause minor to severe facial disfigurement. (13)

As stated by Baek and Son, the posterior alveolar structures serve as a hinge point during posteromedial rotation of the greater segment by nasoalveolar molding device (NAM), which results in midline correction and improvement in the arch symmetry (14)

As expected, posterior cleft widths decreased significantly following NAM in the present study. Three-dimensional evaluation of alveolar changes induced by nasoalveolar molding in infants with unilateral cleft lip and palate (15)

There was no segmental movement was seen in the posterior region, and the decrease in the posterior cleft width can be attributed to growth and remodeling at the medial borders of the cleft segments. (11, 16)

Also, Chaisooktaksin N et al. reported in their study, Three-dimensional Changes of Maxillary Alveolar Morphology After Using Modified Nasoalveolar Molding in Patients with Complete Unilateral Cleft lip and Palate, This study aimed to evaluate the three-dimensional changes in maxillary alveolar morphology after using modified NAM in patients with complete unilateral cleft lip and palate. The result of this study was similar to the result the current study that there was decrease in posterior cleft width after using nasoalveolar molding device (17)

Conclusion: In patients with unilateral complete cleft lip and palate, the acrylic NAM is an effective device in reducing the posterior cleft width.

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