Student's Journal of Health Research Africa
Vol. 4 No. 9 (2023): September 2023 Issue
https://doi.org/10.51168/sjhrafrica.v4i9.646
Original article

PROSPECTIVE STUDY OF CASE SERIES OF UNILATERAL CLEFT LIP AND PALATE TREATED BY PRESURGICAL NASOALVEOLAR SHAPING.

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Abstract

Background:

This study is done to assess the effectiveness of presurgical nasoalveolar modelling to rectify cleft in the lip that is a birth defect.

Methodology:

In this study a comparison is made between various surgeries performed to assess the cleft reduction. This study consisted of 40 patients with cleft lip and palate, presurgical nasoalveolar modelling was done on these patients. All the patients were infant of more than 2 days and less than 44 days of age. This study was conducted for the surgery performed between two years. Presurgical nasoalveolar modelling was done on the patients and after 6 months another lips modification surgery was performed. To evaluate the study the photographs of before and after the surgery were recorded along with the dental model of the maxilla.

Conclusion:

This study concluded that PNAM method of treating the cleft lip and palate caused effective reduction in the cleft lip, the asymmetry in the nasal bone was improved. This method involves a simple procedure yet maintains the quality of treatment.

Recommendation:

This method is preferable to treat birth defect effectively over the conventional invasive surgical procedure.

Keywords: Cleft lip, cleft palate, presurgical nasoalveolar molding, Nasal moulding bulb, Submitted: 2023-08-29, Accepted: 2023-09-08

1. Introduction:

A birth defect due to improper formation of nose at the embryo stage leads to cleft in the lip and the palate. The most difficult of the clefts is the unilateral cleft lip and nose. [1]. It appears like there is an atrophy of the nasal or maxillar tissue [2, 3]. The occurrence of cleft lip or palate is quite common [4]. According to a WHO re- port this phenomenon is so common that every 2 minutes a baby is born with this defect [5]. Considering India it has 3 such infants in every hour [1].

Presurgical nasoalveolar modelling is a comparatively non-invasive procedure in which is performed as early as possible after the birth in which a palate device is used to correct the lip, alveo- lus and nostrils, the palate device also has nasal stent attached to it [6, 7]. PNAM is superior

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to conventional methods owing to its simplicity. PNAM helps in improving the symmetry of nasal tissue, in restoring the tip of the nasal tissue, itremodels the projection from the premaxillary section aligns it with alveolar segments, all this helps in rectifying the cleft in the lip and palate [5,7]. PNAM maintains the aesthetic appearance after the surgery while being simpler comparatively [8-10]. If there is a projection from the maxilla, then orthopaedic surgery is performed before the PNAM procedure. Matsuo and Hirose performed the first surgery by this method on the infants with a cleft lip [11]. Currently there are three such procedures Figueroa's technique, Grayson's technique, and Liou's technique [12,14]

There rarely any studies carried out regard- ing the effectiveness of PNAM in India. The aim of this study is to evaluate the effectiveness of presurgical nasoalveolar modelling in treating cleft lip and palate amongst infants.

2. Materials and Methods:

This is a prospective study of the case series of the infants with complete unilateral cleft in the lip and palate that reported at a tertiary care centre with age more than 2 days and less than 44 days were selected for this study. The study took place for two years.

The infants above the age range set were excluded from the study. Infants with adequate nourishment, no syndrome and not operated previously were considered for the study.

After the first visits orthodontist evaluated the cleft lip. Liou's technique was applied in which both mouldings that is nasal and alveolar were done simultaneously. The device consisted of dental plate and nasal stent that was a 20 com stainless steel guage with a small bulb of resin aat the top. Dental plate with ethe help of dental adhesives was placed on the palate nad dental arch. The defect was supported with the nasal stent. After this, first the cleft position was approxi- mated and then with the help of dental adhe- sives it was placed properly. The dental adhesive pushed the nostrils and narrowed down the nos- trils and the cleft in the alveolus

Twice a week the the bulb on the nasal guage was adjusted to move the alar cartilage into proper position. The push from the dental adhe- sive tapes and stent guage pushed the alveolar de- fct into proper place. Soft tissue liners were added and removed according to the requirement. Caregivers were told to keep appliance in place for 5-5 and half months and remove it during cleaning. This therapy before the surgery which took place after 6 months of birth. All the patients underwent PNAM therapy under the same orthodontist.

3. Results:

Impression were taken on the dental moulds before and after the PNAM therapy. Measurements in the changes of the denture were assessed with the help of these moulds. The data obtained for before and after the study were statistically analysed for significant difference by students t-test. The difference in the measurement was found to be statistically significant that is the p-value was less than 0.005. During the follow up of 6 months for the surgery the results were stable.

4. Discussion:

According to Millard[21], the cleft malformation, whether unilateral or bilateral, can because of inappropriate migration of mesenchyma from maxillary to the nasomedial process. from the maxillary process to the nasomedial processes. Due to this failure, there is an absence of bone fusion between the maxilla and premaxilla, the fibres of muscle cannot migratein the prolabium section. This phenomenon entails a divergence and misalignment of the elements comprising the nasomaxillary complex, which endure without significant amelioration during the process of development.

In instances of a cleft, the premaxilla rotates on the outside and gives out a projection, accompanied by repositioning of the maxillary wall on the anterior side. The aforementioned phenomenon leads to the flattening of the nasal tip and the inferior displacement of the soft triangle,

as stated in reference[22]. The nasal septum exhibits torsion, angulation, and displacement from the vomerine groove, leading to a deviation in the position of the nasal end point [23]. The columella undergoes deflection due to the displacement of the nasal septum, resulting in vertical deficiency on the side affected. The cartilage is shifted from its typical location, resulting in a deformity. The medial crus is positioned at a lower level within the columella, while the point where the two crus meet is distinct from the neighbouring cartilage. The structure in question is situated beneath the corresponding cartilage and has a flattened morphology, being extended and expanded over the fissure at an obtuse orientation [24, 25].

Throughout history, there have been several endeavours to achieve a non-surgical reduction in the dimensions of the alveolar cleft. Matsuo and Hirose are commonly credited with initiating the advent of contemporary presurgical orthopaedic equipment.The user did not provide any text to rewrite. The researcher employed an intraoral acrylic device, resembling an obturator, to bring the alveolar segments into close proximity. The field of presurgical orthopaedic equipment has had continuous advancements over time. The PNAM approach was initially introduced by Grayson et al. in 1993. Several improvements have also been developed for this technology. Furthermore, here Eric Liou's methodology has been employed, in which modification are made from the method outlined by Grayson et al.

A primary objective of Presurgical nasoalveolar modelling is to achieve alignment and approximately place the alveolus tissue of the cleft in proper position, while concurrently rectify asymmetrical cartilage and soft tissue abnormality in nasal area. The aforementioned modifications are accomplished through the incorporation of a nasal stent onto the labial vestibular flange of a typi- cal intraoral moulding plate. The nasal stent and alveolar moulding plate are systematically modified over a span of 5-6 months in order to attain nasal and alveolar symmetry, nasal tip projection, and alignment of the cleft alveolar segments prior to the primary lip, nasal, and alveolar surgical repair. The nasoalveolar orthopaedic appliance is secured using a mixture of adhesive tapes that are placed to both the cheeks and the segments of the cleft lip [26]. The preoperative reducing bones and soft tissue of cleft has been found to significantly decrease the complexity of the sur- gical procedure, leading to enhanced surgical results[19].

The benefits of the procedure in newborn orthopaedics can be evaluated by looking both at soft tissue and bony tissues standpoint. The preoperative reduction of soft tissue and cartilaginous deformities is advantageous in facilitating the attainment tissue restoration with minimal strain on tissue and it is ideal for forming a scar. Additionally, it decreases both the quantity and intricacy of minor procedures to repair the tissues needed to uphold satisfactory aesthetics during the nasal growth process.

This study was done to assess the efficiency of Presurgical Nasoalveolar Moulding (PNAM) in the treating of Complete Unilateral Cleft Lip and Palate (CUCLP). The average age at which PNAM commenced was 23 days, with age of infants were more than 2 days and less than 44 days. The device was activated every two weeks due to the patients' long distance travelling and socioeconomic limitations, which prevented them from attending regular weekly follow-up appointments. This differs from the studies conducted by Liou et al. (2004) and Grayson et al. (1999)[12,15], where the appliance was operated on a weekly basis. A cohort of 24 patients initiated the PNAM ther- apy, with 4 individuals (17%) discontinuing treatment. The reasons for discontinuation included non-compliance, socioeconomic constraints preventing regular therapy attendance, systemic illnesses, and hospitalisation. Consequently, these individuals were excluded from the study. The individuals in our study were in the later stages of the optimal period for cartilage moulding, which has been identified as the initial six weeks of life.The user has provided a numerical reference without any accompanying text. The duration of the therapy averaged to about 120 days. Therapy for alveolus tissue and nasal tissue were initiated simultaneously, regardless of the degree of cleft gap. This was on contrary to the approach de-

scribed by Grayson et al., who recommended initiating nasal tissue therapy only when the alveolar tissue ridges were 6mm apart.

It was observed that the nostril basal width exhibited a statistically significant reduction, with an average reduction of 4.04 mm. Similarly, the nostril width displayed an average reduction of 4.16 mm. Conversely, the columellar length experienced an average rise of 2.31 mm following the therapy. Notably, the pre-treatment columellar length was only merely increased by roughly 0.45 mm, rendering the post-treatment increase statistically significant. The procedure resulted in a mean rise of 3.02 mm in nasal dome height. The average increase in nostril height was 2.9 mm. This study saw a improved soft tissue nose abnormalities across all the dimension and this was found to be significant statistically.

Liou et al. (2004) conducted a study that yielded findings consistent with our own research, indicating a mean rise of 2.7 mm in nose height. In our investigation, we observed a slightly higher increase of 2.9 mm. In the study conducted by the authors, the nasal dome height exhibited an increase of 2.1 mm, but in our investigation, the nasal dome height was observed to be 3.02 mm. Similarly, a comparable pattern was observed in the columellar length, which measured 2.8 mm in the authors' study, in contrast to our study where a minor increase of 1.8 mm in length was observed. The study conducted by the authors saw a reduction of 1.5 mm in nostril basal width. In contrast, our study found a decrease of 4.04 mm in the same aspect. Similarly, the authors reported a loss of 3.4 mm in nostril width, which closely aligns with the 4.1 mm reduction observed in this case.

A comparable investigation conducted [26], wherein it was seen that the deviation of the columella grew from an initial angle of 53.3° to an upright position of 69.9°. This finding closely aligns with our own study, which demonstrated that the columella deviation shifted from an initial angle of 41.5° to an upright position of 61.20°, moving towards the midsagittal plane.

5. Conclusion:

The efficacy of PNAM as an additional therapy in mitigating hard and soft tissue cleft deformities prior to surgical intervention has been demonstrated. Nevertheless, it is crucial for parents or carers to actively engage in the treatment strategy. The findings of this study indicate that PNAM therapy resulted in enhancements in nasal aesthetics, reductions in cleft size, and alignment of the maxillary arch in individuals with unilateral cleft lip and palate. Additionally, there was a decrease in the size of the cleft alveolus and palate. Therefore, it is recommended that this therapy be included as a standard technique in the treatment protocol for all patients with UCLCP. This will lead to improved surgical outcomes and enhanced aesthetics and functionality, while min- imising costs and the need for additional proce- dures.

6. Limitation:

Sample size of the study is small to compare it with invasive surgical methods. However, the results were promising

7. Recommendation;

This method is preferable to treat birth defect effectively over the conventional invasive surgical procedure.

8. List of abbreviation:

PNAM- Presurgical nasoalveolar modelling
WHO- WORLD HEALTH ORGANIZATION
CUCLP- Complete Unilateral Cleft Lip and Palate

9. Acknowledgment:

We are thankful to the patients and their caring parents without them the study could not have been done. We are thankful to the supporting staff of our hospital who were involved in the pa- tient care of the study group.

10. Conflict of interest:

No conflict of interest

11. Funding:

Study was not funded

12. Publisher details:

Publisher: Student's Journal of Health Research (SJHR)
(ISSN 2709-9997) Online
Category: Non-Governmental & Non-profit Organization
Email: studentsjournal2020@gmail.com
WhatsApp: +256775434261
Location: Wisdom Centre, P.O.BOX. 148, Uganda, East Africa.

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