

Supporting the Drive to Thrive in Cleft Lip and Palate Infant- A Case Report

THABITHA RANI S¹, MANJULA M², SREELAKSHMI N³, RAJENDRA REDDY E⁴, RAJESH A⁵

ABSTRACT

In infants with cleft lip and palate, failure to thrive (FTT) condition has largely been attributed to early feeding difficulties. Presurgical Nasoalveolar Molding (PNAM) forms an integral part of treatment modality for cleft infants in such conditions, by providing a myriad of benefits. It balances several aspects of treatment such as growth, aesthetics and function in cleft infants and also provides psychological reassurance to the parents. This clinical report describes the presurgical management of an infant with complete unilateral cleft lip and palate who was in failure to thrive condition.

Keywords: Failure to thrive, PNAM, Cleft lip and palate

INTRODUCTION

Cleft lip and palate is the most common congenital craniofacial malformation, affecting 1 in 700 live births [1]. Faltering weight or FTT is a condition in which the rate of weight gain is significantly below that of other children of similar age and gender [2]. Thus, adequate nutrition and appropriate weight gain play a significant role during the infantile period of life for immunity and growth. Therefore, cleft infants with failure to thrive, need to gain weight for 'catch-up' growth, as well as for a good response and recovery to/from future surgical procedures.

PNAM therapy is a tenet in the early management of cleft lip and palate infants. A case of unilateral complete cleft lip and palate, treated with PNAM therapy in FTT condition, has been described.

CASE REPORT

A 2-month-old unilateral, complete cleft lip and palate (UCLP) infant with a Ryles tube in place, who was in a failure to thrive condition, was referred to the Department of Paedodontics, from Neonatal Intensive Care Unit (NICU), Kamineni Institute of Dental Sciences, Narketpally, for treatment and evaluation [Table/Fig-1]. Parents

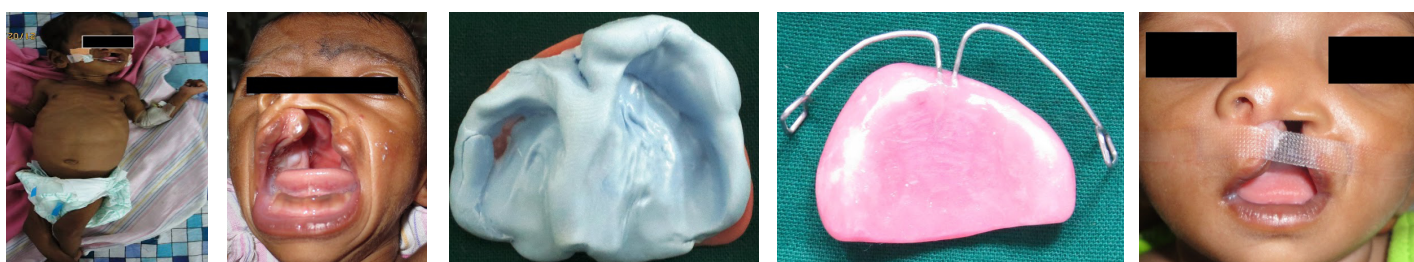
complained that the baby was unable to drink milk either through the bottle or breast, because of which baby had not gained weight and had a weight of only 2 kg even after 2 months. A treatment protocol was planned to improve feeding with the help of a feeding plate, followed by PNAM therapy, and the same was explained to parents.

Impression Making

After a thorough intraoral examination, an impression of the maxillary arch was obtained with a heavy-bodied poly vinyl siloxane impression material, from previously made special trays [Table/Fig-2,3], with the infant held in a reclined position in parents' lap, under supervision of the emergency team.

Fabrication of the Molding plate

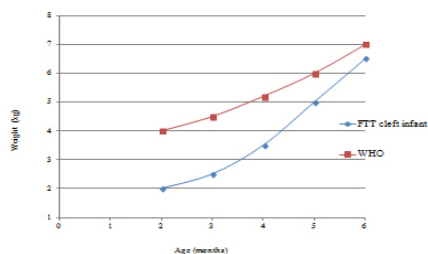
Two dental stone casts were prepared from the obtained impression. All the undercuts and cleft space were blocked on the working cast with baseplate wax. A moulding prosthesis of 2-3 mm thickness was fabricated using autopolymerizing acrylic resin, along with stainless steel wire outriggers, as described by Suri and Tompson [3] and



[Table/Fig-1]: UCLP infant in failure to thrive condition **[Table/Fig-2]:** Intraoral view of the unilateral complete cleft on left side of the infant. **[Table/Fig-3]:** Primary impression of the maxilla **[Table/Fig-4]:** Feeding appliance without nasal stent **[Table/Fig-5]:** Lip taping



[Table/Fig-6a]: PNAM plate **[Table/Fig-6b]:** Infant with nasoalveolar molding appliance **[Table/Fig-7]:** Immediately after lip repair **[Table/Fig-8]:** Anterior cleft widths at 2 and 6months



[Table/Fig-9]: Comparison of weight gain curve between FTT cleft infant and WHO standards **[Table/Fig-10a]:** Nasal asymmetry before PNAM therapy **[Table/Fig-10b]:** Post PNAM therapy

it was inserted on the same day [Table/Fig-4]. The moulding plate was checked for rough surfaces and overextensions, to prevent soft tissue trauma. Parents were instructed about the oral hygiene maintenance and continuous use of the appliance. The infant was reviewed after 24 hours to make sure that the soft tissue was free of any ulceration and was recalled after one week. As the baby was well adapted to the appliance, lip taping was initiated for the approximation of cleft lip segments [Table/Fig-5] and activation of the moulding plate was also done by trimming the tissue surface of the moulding plate, in such a way as to make alveolar segments to move into the space which was created. In the following week, a nasal stent was added to the moulding plate for moulding of flat nasal cartilage on the cleft side [Table/Fig-6a and 6b]. Biweekly appointments were given for the activation of moulding plate and nasal stent, as described by Grayson BH [4]. The weight of the infant was monitored at each visit and it was then compared with the World Health Organization (WHO) standard data. Another maxillary impression was made when the baby was 6 months of age i.e., just before lip repair, to assess the progress of PNAM therapy. Later, lip repair was carried out successfully by the cleft surgery team, with no postoperative complications [Table/Fig-7].

TREATMENT OUTCOME

Model analysis: The landmarks on the maxillary casts used for analysis were marked according to method of Friede et al., [5], and Seckle et al., [6]. The measurements of the cleft widths, arch widths and length of the cleft alveolar segments have been given in [Table/Fig-1]. It was observed that in the subsequent appointments, the anterior cleft width had significantly reduced, whereas anterior and posterior arch widths had appreciably increased [Table/Fig-8].

Growth analysis: A gradual increase in weight gain was observed, that fell in the range given by WHO, during 4 months of PNAM therapy. Weight gain of the infant at each visit has been represented in [Table/Fig-9].

Nasal Moulding: On appraisal of photographs, it was observed that there was a marked improvement in the nasal symmetry, a decreased interalar discrepancy and a reduced nasal tip deviation after 4 months of PNAM therapy [Table/Fig-10a and 10b].

DISCUSSION

Multidisciplinary treatment of cleft infant in FTT condition is more challenging to the cleft team. It has been reported that there is a strong relationship between cleft type and weight gain of the infant [7,8]. Fabricius and Aquapendente first presented that cleft infants had a higher rate of malnutrition which was secondary to suctioning impairment [9]. Early feeding management in a cleft infant specially aims to ensure adequate weight gain at the earliest, for future surgical interventions.

PNAM was first introduced by Grayson et al., [4], who adopted Matsuo's [10] concept of moulding cartilages from birth to 6 weeks of age. The principal objective of PNAM is to approximate the cleft alveolar segments and to reduce the soft tissue and cartilaginous nasal deformity, thereby aiding in surgical soft tissue repair to optimal

conditions under minimum tension, to minimize scar formation. Considering the multitudinous benefits of PNAM therapy, this was adopted in our case and it achieved an appreciable cleft width reduction in anterior, middle and posterior regions of cleft alveolar segments, and an increase in not only the anterior and posterior arch widths, but also in the lengths of the lesser and greater segments. In addition, a remarkable weight gain of 4.5kg, along with an improved nasal symmetry, was obtained after presurgical orthopaedic treatment period of 4 months. Lip taping offered outer pressure to approximate cleft lip segments and it minimized upper lip tension before and after lip repair, thereby reducing scar formation. It also decreased the width of the nasal base [11,12].

Numerous studies have documented the technique of PNAM therapy following different treatment protocols in the management of cleft infants [3,4,13,14]. However, only a few studies have reported the actual changes in arch dimensions and nasal symmetry after PNAM therapy. With presurgical orthopaedics alone, Huddart [15] reported a 50% palatal cleft width reduction, along with narrowed lip and alveolar clefts. Whereas, Shaw and Semb [16] advocated reduction of excessive alveolar cleft width and approximation of lip margins in complete unilateral clefts. Peltomaki T et al., [17], reported that the reduced anterior cleft width resulted in a uniform midface growth.

Deng et al., [18] reported cleft narrowing by 5.3mm, while Pai et al., [19] observed a reduction of 5.8mm after 3 to 4 months of presurgical orthopaedic treatment. Ezzat et al., [20], reported a significant decrease and increase in inter-segmental distance and arch width respectively, after PNAM therapy. Mishra et al., [21], noticed an increase in cleft alveolar width in the control group (without PNAM), both in unilateral and bilateral clefts, after one year of lip repair. Prashanth CS et al., [22] demonstrated a cleft width reduction of 5 mm with the use of PNAM appliance. Patel D et al., [23], reported that mean cleft width reductions at anterior and middle portions of the alveolus were 3.17mm and 1.8mm respectively. In addition, an increase in the lengths of greater and lesser alveolar segments, along with an increase in posterior arch width was observed. Some of the previous studies have reported other benefits such as an improved maxillary arch development [24], improved feeding and growth of the infant [25] and psychosocial benefits to the parents [26], which we observed in our case also, even in failure to thrive condition.

Nasal moulding could be analyzed by using photographs [19,23], laser light scanners [27], facial models [28] and 3D surface cameras [12]. In our case, photographs were used to assess the nasal moulding, as they were economical, convenient and non invasive. In our case, an improved nasal symmetry, a decreased interalar discrepancy and a reduced nasal tip deviation were achieved during PNAM therapy and they were maintained even after 1 month of post lip repair. Maull et al., [12], Cutting et al., [27] and Grayson et al., [4] advocated a significant improvement in nasal symmetry three dimensionally with PNAM therapy, in their longitudinal studies. Deng et al., [18] observed an enhanced nasal profile in 76% of the sample. Pai et al., [19] observed an enhanced nasal symmetry in terms of nostril width, height and columella angle, 1 month after

Parameters	At 2 months of age (Before PNAM)	At 6 months of age (After PNAM)	Difference
Anterior cleft width (mm)	10.5	2	8.5
Anterior arch width (mm)	25	26	1
Posterior arch width (mm)	37	38.5	1.5
Cleft width at the middle of the palate (mm)	10	6.5	4.5
Posterior cleft width (mm)	10.5	9	1.5
Length of the lesser segments (mm)	20	23.5	3.5
Length of the greater segments (mm)	28	33	5

[Table/Fig-11]: Study Cast Measurements

lip repairs. Ezzat et al., [20] and Mishra et al., [21], observed a significant increase in the columellar length and nostril height with PNAM therapy. Similar stable results were observed at 6 months and 1 year after lip repairs [29,23] [Table/Fig-11].

CONCLUSION

PNAM therapy was proved to be the most efficient and effective way of treating failure to thrive cleft infants, even after initiation of the therapy at the age of 2 months. The impediment in the milestones of the normal maxillary arch development could be overcome by the use of palatal moulding plate that aided in the approximation of cleft alveolar segments. In addition, moulding of the flattened cleft nasal cartilages and remarkable weight gain were also attained. This further facilitated the surgical lip repair, with no postoperative complications. PNAM therapy, hence, provided a positive psychological impact on the parents, due to the improvement in overall growth of the infant.

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PARTICULARS OF CONTRIBUTORS:

- Reader, Department of Pedodontics and Preventive Dentistry, Kamineni Institute of Dental Sciences, Narketpally, Nalgonda, India.
- Professor, Department of Pedodontics and Preventive Dentistry, Kamineni Institute of Dental Sciences, Narketpally, Nalgonda, India.
- Professor, Department of Pedodontics and Preventive Dentistry, Kamineni Institute of Dental Sciences, Narketpally, Nalgonda, India.
- Professor & HOD, Department of Pedodontics and Preventive Dentistry, Kamineni Institute of Dental Sciences, Narketpally, Nalgonda, India.
- Senior Lecturer, Department of Pedodontics and Preventive Dentistry, Kamineni Institute of Dental Sciences, Narketpally, Nalgonda, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Thabitha Rani S,
Kamineni Institute of Dental Sciences, sreepuram, Narketpally, Nalgonda -508254, India.
Phone: 9490976363, E-mail: drstranipedo@gmail.com

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