Case Report

A Comprehensive Approach to Unilateral Cleft Lip and Palate Management through Presurgical Nasoalveolar Molding and Surgical Repair in a Neonate

Abstract

This case report details the successful application of nasoalveolar molding (NAM) in a 4-day-old neonate with a complete unilateral cleft lip and palate, showcasing a comprehensive treatment approach involving presurgical NAM and subsequent surgical repair. The NAM technique, pioneered by Barry H. Grayson, utilizes a specialized appliance to shape the alveolar ridge and nasal cartilage concurrently. The case demonstrates favorable outcomes, with the alveolar segments brought closer to normalcy after approximately 4 months of NAM. The patient underwent further surgical repair, as per the protocol emphasizing the interdisciplinary approach in cleft management.

Keywords: *Cleft lip and palate, infant orthopedics, nasoalveolar molding*

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Introduction

Presurgical nasoalveolar molding (PNAM) has emerged as a transformative approach in the realm of infant orthopedics, particularly in the correction of cleft lip and palate anomalies. Since the 1950s, various presurgical interventions have been employed to address these congenital deformities, but many have fallen short in effectively addressing nasal cartilage deformity in cases of unilateral cleft lip and palate (UCLP) and bilateral cleft lip and palate, as well as deficiencies in columella tissue in infants with bilateral cleft.

A pioneering technique in this field, nasoalveolar molding (NAM), was developed by Barry H. Grayson, offering a novel perspective and a comprehensive solution to the challenges posed by cleft alveolar and nasal deformities in infants. The technique involves the utilization of a specialized NAM appliance, comprising an intraoral molding plate with nasal stents designed to simultaneously shape the alveolar ridge and nasal cartilage. The primary objective of PNAM is to mitigate the severity of the initial cleft deformity, providing surgeons with the opportunity to achieve more effective and esthetically pleasing repairs of the cleft alveolus, lip, and nose.[1]

Case Report

A 4-day-old neonate female was referred to the orthodontics wing of the Dental and Oral Surgery Department at Lady Hardinge Medical College and Hospital with the chief complaint of a gap in lips and palate. Clinical examination revealed a complete UCLP on the left side, classified as Veau's Type III with the alveolar gap between lesser and greater segment of 15 mm [Figure 1a-d]. A complete case history was recorded, and a holistic treatment plan was made involving PNAM followed by primary surgical repair.

Upon obtaining informed consent from the parents, which included a thorough explanation of the potential risks, benefits, use, and maintenance of the NAM appliance, the case proceeded to the impression procedure. A custom-made tray, devoid of sharp edges, was fabricated based on a primary cast from the initial impression taken with impression compound. The final impression, using Putty (Reprosil, Dentsply), was made with careful attention to avoid airway obstruction and aspiration in the supine position. A dental stone cast was then made of the final impression for the fabrication of the NAM appliance.

Modeling wax was applied to cover the alveolar gap and any undercut spots on the final model. Subsequently, a

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Figure 1: Prenasoalveolar molding records (a-d), Initial nasoalveolar appliance (e), Eruption of neonatal tooth (f), Nasoalveolar appliance with nasal stent (g and h)

transparent acrylic resin NAM plate (DPI-RR light Cure, Acrylic repair material) of approximately 2 mm thickness was fabricated. A retention button was custom-made and positioned at an angle of about 45°–50° anteriorly to the plate. Since the patients had unilateral clefts, only one retention arm was incorporated. It was strategically placed near the inner aspect of the affected nostril and then covered with orthodontic resin during fabrication.[2] To ensure proper fit and retention, red orthodontic elastics were used on the handle of the NAM plate. Once inserted, stability was achieved, and 3M Tegaderm was applied to both sides of the cheeks as base tape. Steri Strips™ were extended and attached to the base tapes on the infant's cheeks, and regular replacement of elastics was performed to maintain the necessary tension. The appliance remained in place for 24 h, with removal only for cleaning as it will additionally aid as feeding plate[3] [Figure 1e].

Weekly follow-ups were conducted to assess the need for modifications to the NAM appliance for selective addition and subtraction in the appliance with soft-tissue liners to direct the growth of alveolar segments. There was an eruption of the single neonatal tooth after the use of the NAM appliance for few weeks, after confirming the diagnosis of the neonatal tooth by clinical and radiographic examination, it was planned for extraction under local anesthesia due to hindrance in placing the NAM appliance [Figure 1f]. On healing of the extraction socket, a new NAM appliance was fabricated for further progress of NAM therapy. After approximately 8 weeks of PNAM and when the alveolar cleft was <5 mm, a nasal stent was added to enhance nasal symmetry with continuous modifications to achieve the desired results [Figure 1g and h].

Approximately 4 months after the initiation of PNAM, the alveolar segments were successfully brought to a distance of approximately 3 mm from the pre-NAM measurement of 15 mm with well appreciable change in nasal cartilage outline on the cleft side [Figure 2a and b]. Evaluation of the lip, alveolus, and nasal area position was conducted by oral and maxillofacial surgeons and orthodontists, leading to the implementation of surgical repair utilizing Millard's rotation-advancement technique [Figure 2c and d]. The patient continues to receive consistent follow-up and comprehensive management from an interdisciplinary cleft team at the hospital [Figure 2e-g].

Discussion

NAM devices typically consist of oral plates and nasal stents that are custom-fitted to the infant's anatomy of the cleft. These appliances apply gentle pressure to the nasal and alveolar segments, gradually guiding them into a more favorable position.[1]

Studies have reported positive outcomes associated with the use of NAM in UCLP cases.[1,4] Improved nasal symmetry, reduced severity of the cleft, and enhanced surgical outcomes are among the documented benefits.[2] In addition, early correction of nasal deformities may positively impact speech development and psychosocial well-being as the child grows.[1]

The exceptional malleability of infant cartilage is attributed to the elevated presence of hyaluronic acid during infancy. Newborns have peak levels of estrogen, which

Figure 2: Postnasoalveolar molding (a and b), Day 1 postsurgery (c and d), 1 week postsurgery (e), 6-month follow-up postsurgery (f and g)

further boosts hyaluronic acid production in the body. Consequently, cartilage in areas such as the neonatal nasal structure, maxillary alveolar bone, and soft tissues around the nose and lips exhibits high plasticity. Around 1 month after birth, estrogen levels naturally start decreasing, leading to a gradual reduction in cartilage plasticity. The PNAM appliance operates on this principle to enhance facial development in infants.[5]

While NAM has shown promise, its success depends on factors such as patient compliance, caregiver commitment, and the severity of the initial cleft deformity. The need for meticulous follow-up and adjustments to the NAM appliances requires a dedicated health-care team. Moreover, individual variations in response to the molding process highlight the importance of personalized treatment plans.

In the present case, the alveolar cleft reduced from 15 mm pretreatment to 3 mm post-NAM, with significant improvement in nasal symmetry. By addressing the nasal and alveolar segments early on, NAM can potentially reduce the extent of the cleft defect, making subsequent alveolar bone grafting (ABG) procedures more manageable and making the placement of bone grafts during surgery more predictable and precise. This can improve the surgical outcome and increase the likelihood of successful graft integration.[6,7]

Based on the evidence available in the literature, the rate of postoperative bone formation appears to be higher, and the incidence of complications is lower when utilizing ABG in conjunction with presurgical orthodontic measures.[8] However, with the minimal complications associated with NAM, such as mucosal irritation, it continues to demonstrate effectiveness and widely used method.[9]

Ongoing research in the field aims to refine NAM protocols, optimize appliance design, and assess the long-term outcomes of patients who undergo this presurgical intervention. Comparative studies evaluating the effectiveness of NAM in different cleft severity levels and diverse patient populations contribute valuable insights for further refinement of clinical guidelines.

Conclusion

NAM represents a promising approach in the management of UCLP. Early intervention, meticulous planning, and a multidisciplinary team approach contribute to successful outcomes. The presented case showcased outstanding outcomes following PNAM, with postsurgery results reflecting improved anatomical and aesthetic aspects. As research continues to evolve, NAM holds the potential to enhance the quality of life for individuals with UCLP by minimizing the impact of the initial cleft deformity and optimizing surgical outcomes.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the legal guardian has given his consent for images and other clinical information to be reported in the journal. The guardian understands that names and initials will not be published and due efforts will be made to conceal patient identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Grayson BH, Santiago PE, Brecht LE, Cutting CB. Presurgical nasoalveolar molding in infants with cleft lip and palate. Cleft Palate Craniofac J 1999;36:486-98.
2. Batra P, Datana S, Arora A. Presurgical infant orthopedics: A developmental and clinical evolution. J Cleft Lip Palate Craniofacial Anomalies 2022;9:101-9.
3. Koya S, Shetty S, Husain A, Khader M. Presurgical nasoalveolar molding therapy using Figueroa's NAM technique in unilateral

cleft lip and palate patients: A preliminary study. J Clin Pediatr Dent 2016;40:410-6.
4. Liou EJ, Subramanian M, Chen PK, Huang CS. The progressive changes of nasal symmetry and growth after nasoalveolar molding: A three-year follow-up study. Plast Reconstr Surg 2004;114:858-64.
5. Li L, Liu T, Fang D. Design of unilateral complete presurgical nasoalveolar molding (PNAM) corrector based on feature points extraction of comple×3D surface. Appl Sci 2023;13:5251.
6. Hegde RJ, Kharkar VR, Kamath S. Presurgical nasoalveolar molding in unilateral cleft lip and palate. Contemp Clin Dent 2015;6:567-9.
7. Bhutiani N, Tripathi T, Verma M, Bhandari PS, Rai P. Assessment of treatment outcome of presurgical nasoalveolar molding in patients with cleft lip and palate and its postsurgical stability. Cleft Palate Craniofac J 2020;57:700-6.
8. Ma L, Hou Y, Liu G, Zhang T. Effectiveness of presurgical orthodontics in cleft lip and palate patients with alveolar bone grafting: A systematic review. J Stomatol Oral Maxillofac Surg 2021;122:13-7.
9. Alkhames HM, Kodali MV, Nasir EF, Hassan M, Kodali US. Presurgical nasoalveolar molding-efficacy and biomechanics in management of cleft lip and palate: A review of the literature. Eur J Gen Dent 2023;12:7-13.