Open Access

Case Report

A Low-Cost Independent Forehead-Anchored Nasal Molding System Combined with Early Vomer Flap Closure in the Management of Complete Unilateral Cleft Lip and Palate: A Technical Note and Case Report

Sana Tariq, Usmanulhaq*,

Department of Orthodontics, H.B. S. Dental College, Islamabad Pakistan,
*Department of Oral and Maxillofacial Surgery, Wah Medical College, Rawalpindi Pakistan

ABSTRACT

Presurgical nasoalveolar molding (PNAM) remains a valuable adjunct in the management of infants with cleft lip and palate. Traditional Grayson PNAM systems employ a nasal stent attached directly to an intraoral molding plate. Recent developments have proposed split-type PNAM systems utilizing digital workflows and three-dimensional printing technologies. However, access to such technologies remains limited in many regions of the world and to specific high-income patient category. A neonate, 3 days old, presenting with non syndromic isolated complete unilateral cleft lip, alveolus, and palate underwent treatment using a conventional acrylic molding plate and an independent extraoral nasal stent. Following presurgical orthopedic correction, primary cheiloplasty and simultaneous vomer flap closure were performed. Significant improvement in nasal morphology and alveolar approximation was achieved. Following surgical intervention, nasal regurgitation during feeding was eliminated, the feeding plate was discontinued, and conventional bottle feeding became possible. This report introduces a practical modification that separates nasal and alveolar biomechanics while emphasizing functional rehabilitation.

Keywords: Unilateral cleft lip and palate, Presurgical nasoalveolar molding, vomer flap, nasal molding, cleft orthopedics, feeding rehabilitation, resource-limited settings.

How to Cite This Article: *Tariq S, Usmanulhaq. A Low-Cost Independent Forehead-Anchored Nasal Molding System Combined with Early Vomer Flap Closure in the Management of Complete Unilateral Cleft Lip and Palate: A Technical Note and Case Report. Pak Armed Forces Med J 2026; 76(Suppl-10): S1692-S1695. DOI: https://doi.org/10.51253/pafmj.v76iSUPPL-10.14586*

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (https://creativecommons.org/licenses/by-nc/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Presurgical nasoalveolar molding has significantly improved presurgical preparation of infants with cleft lip and palate by reducing cleft severity and improving nasal symmetry before primary surgery. Traditional Grayson PNAM systems employ a nasal stent attached directly to an intraoral molding plate.[1] While effective, this configuration creates reciprocal force systems 2 whereby nasal molding forces may influence plate retention and vice versa. The biggest problem that we encountered repeatedly was compliance; the child usually refused to wear the appliance after insertion of the nasal stent. Recent developments have proposed split-type PNAM systems utilizing digital workflows and three-dimensional printing technologies.[2] However, access to such technologies remains limited in many regions of the world and to specific high-income patient category. As after the initial lip repair since the palate is still open hence specialized care for feeding needs to be continued, either feeding plate or special feeders. In parallel, the optimal timing and extent of palatal repair continue to be debated. Literature has much evidence stating consequent gingivoperiosteoplasty (GPP) to alleviate the need of future alveolar bone grafting. While GPP may promote alveolar bone formation, concerns remain regarding its potential influence on maxillary growth. Vomer flap closure performed during primary lip repair has emerged as an alternative strategy aimed at reducing oronasal communication, improving feeding, and facilitating subsequent palatal reconstruction. Belonging to a low and middle income country that is facing the worst economic crunch of the history, having a disease that not only is common but also has a treatment stretched over decades, becomes a lifetime liability for the patient and family along with causing a huge burden of care on health care system and its budget. The treatment not only comprises multiple surgeries, orthodontic care, prosthodontic rehabilitation, and plastic surgeries, but also involves extensive neonatal nursing, specialized feeding care, speech development, psychological and psychiatric care of both child and parents. Hence, the burden of care is extensive and multifold – financial, esthetic as well as moral. State of the art treatments, CAD-CAM designed

Correspondence: Dr Sana Tariq, Department of Orthodontics, H.B. S. Dental College, Islamabad Pakistan
Received: 19 Jun 2026; revision received: 29 Sep 2026; accepted: 30 Sep 2026

molding plates, and nasal stents 2 seem very promising but are definitely out of reach for the common man. Again we have seen parents not getting their children treated because of financial handicap.

The present report describes a multidisciplinary treatment approach incorporating a low-cost independent nasal molding system, conventional alveolar molding, primary lip repair, and simultaneous vomer flap closure.

CASE PRESENTATION

A neonate, 2 days old, presented to the Orthodontics department, HBS dental college, Islamabad, Pakistan, on Jan 26th, 2026, with a complete unilateral cleft lip, alveolus, and palate (Figure-A). Clinical examination revealed: Wide alveolar cleft, marked nasal asymmetry, collapsed cleft-side lower lateral cartilage, protrusive left premaxillary segment with gross misalignment, and buccal placement as compared to the right one. Two natal teeth were present in the lower anterior region and one neo-natal tooth erupted in upper anterior region just near to the cleft on the left premaxillary segment, after 9 days of presentation. Functionally, the patient had significant feeding difficulty with nasal reflux of milk. History and medical examination records (as examined by medical specialists) revealed that this was an isolated, non -syndromic cleft. Parents were maternal cousins, and this was their firstborn. According to the LAHSHAL classification it was "LAHSH" unilateral, and on Kernahan and Starks grid, it was R-1,2,3,7,8,9, including nasal floor.[3,4]

The treatment objectives formulated were to approximate alveolar segments, improve nasal morphology and build columellar support, facilitate esthetic primary surgical repair, improve feeding function and reduce caregiver burden.

Technique: PNAM- Impression was recorded using an addition silicone putty material placed in a customized acrylic tray fabricated indigenously at in-house lab of HBS Dental College, Orthodontics department, (Figure-B). An impression was taken on the dental unit with the child held upside down in the mother's lap. Meanwhile, a day before, coordination was done with anesthesia team and OR (operating room) was held on standby to cater to any emergency situation during impression recording. An uneventful impression was acquired, (Figure-C). Upon impression a feeding plate was fabricated immediately and inserted. Patient was sent home and recalled after 2 days for PNAM appliance insertion.

Conventional Presurgical Orthopedics was initiated using an acrylic molding plate, fabricated using standard laboratory procedures. Plate was inserted. Parents were instructed regarding the use of PNAM plate, along with the lip tapping protocol, (Figure-D). Tegaderm patch was applied to the cheeks bilaterally and 6mm wide Steri Strip was stretched from lesser (right) segment towards the greater (left) segment of the lips. It was ensured that the tape was providing adequate tension to pull both segments together. Two independent Steri Strips- 3mm- were engaged with 1/8" orthodontic elastics and attached to the handle of the PNAM plate and secured to both cheeks, to prevent the plate from dislodging and possible choking of the airway, (Figure-D). The patient was recalled every week for activation of the appliance. The PNAM plate was ground on the inner surfaces of lateral walls and palatal walls; a self-cure chairside soft reliner was used to build on the lateral walls' outer surfaces. During fabrication of the plate, the cleft area was blocked with wax, and the plate had continuity between alveolar ridges; this excluded the need for subsequent grinding of acrylic from that region. However, to push the bucally prominent greater segment inwards, soft-reliner was added on the anterior wall of the PNAM plate. In around 6 activations and 2 months duration a significant alignment of alveolar ridges was achieved. Beyond that only activations done were to accommodate the growing maxilla of the baby. At around 8th week nasal molding was initiated using modified nasal stent, (Figure-E).

Independent Nasal Molding System unlike traditional PNAM systems, the nasal molding component was completely separated from the oral appliance. It was a comma shaped acrylic body with a hole at the upper end to pass Steri Strip and a rounded ball end on the nasal side to lift up the collapsed nostril, (Figure-E). The stent was fabricated using conventional acrylic and secured extraorally using Steri-Strips attached to the forehead. The custom tear-drop shaped steri strips were not locally available so we used thin 3mm width steri strip to secure the stent to forehead. No attachment to the oral molding plate was utilized.

Surgery: Following completion of the presurgical orthopedic phase, primary lip repair was performed at about 3 months and 2 weeks of age, on May 18th, 2026 (Figure-F). Though active appliance therapy was completed at about 3 months, the surgeon waited for

the completion of the 10 rule, 10 pounds weight, 10µg of hemoglobin at 10 weeks of age. Instead of gingivoperiosteoplasty, the surgical team elected to perform simultaneous vomer flap closure. This decision was based on the desire to improve feeding function and reduce nasal regurgitation while avoiding potential concerns regarding maxillary growth restriction associated with early alveolar surgery. Post-surgery results are shown in Figure-F.

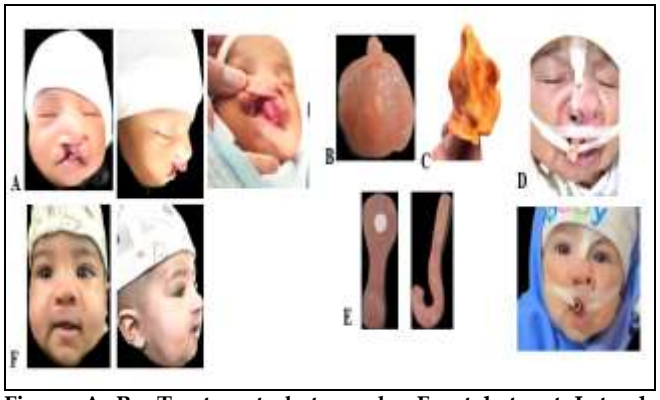


Figure: A- Pre Treatment photographs- Frontal at rest, Lateral, Frontal with lips retracted. B- Custom in-house fabricated impression tray. C- Impression recorded in putty. D- Appliance – In place. E- Nasal Stent- front view, side view. F- Post treatment photographs - Frontal at rest, Lateral

Outcomes: Exceptional outcomes were encountered in terms of anatomical corrections as well as functional ones. Anatomically, there was observed a significant reduction of alveolar cleft width, improved approximation of lip segments, improved projection of the cleft-side nostril, enhanced nasal symmetry, improved alar contour, and a lengthened columella. Regarding functional outcomes, an elimination of clinically significant nasal reflux of milk was observed with discontinuation of feeding plate therapy. A successful transition to conventional bottle feeding was achieved. This all resulted in an improved caregiver-reported feeding efficiency and caregiver compliance during the treatment.

DISCUSSION

In comparison to the original Grayson's design and the neo CAD-CAM printed design, this modification provided independent nasal and alveolar force systems, continuous nasal molding regardless of oral appliance wear, simplified appliance insertion and removal, reduced appliance complexity and low-cost fabrication using routinely available materials.

Biomechanically the traditional PNAM generates reciprocal interactions between the nasal stent and the molding plate.1 The independent design eliminated these interactions. The extraoral anchorage system delivered a superiorly directed force vector directly to the cleft-side nasal cartilage without transmitting reaction forces to the oral appliance.[2,3] This allowed independent adjustment of nasal correction while maintaining stable alveolar molding.[4]

The present case demonstrates three important concepts. First, separation of nasal and alveolar biomechanics may simplify appliance management while preserving effective nasal correction. Unlike traditional PNAM systems, the independent forehead-anchored stent remained functional even during periods when the oral appliance was removed.[2,5] Second, the described modification was achieved without CAD/CAM technology, three-dimensional printing, or specialized laboratory infrastructure. The technique, therefore, possesses considerable potential for implementation in low-resource environments.[6,7] Third, integration of presurgical orthopedics with simultaneous vomer flap closure produced meaningful functional benefits. Most PNAM reports focus primarily on morphologic measurements. In contrast, the present protocol resulted in the elimination of nasal regurgitation and discontinuation of feeding plate therapy.[8,9] (Table).

Table: Comparison with Conventional Presurgical Nasoalveolar Molding (Grayson's and Computer-Aided Design and Computer-Aided Manufacturing)

Feature	Conventional Presurgical Nasoalveolar Molding (PNAM)	Present Technique
Nasal stent anchorage	Attached to oral plate	Independent forehead anchorage
Force systems	Interdependent	Independent
Fabrication	Specialized PNAM in CAD-CAM design	Conventional acrylic
0. 0Nasal molding during plate removal	Interrupted	Continues
Caregiver handling	More complex	Simplified
Digital technology required	Often desirable	Not required
Functional feeding outcome reported	Rarely emphasized	Primary outcome
Palatal strategy	Variable	Early vomer flap closure

**PNAM: Presurgical Nasoalveolar Molding,CAD-CAM:Computer-Aided Design and Computer-Aided Manufacturing*

From a multidisciplinary perspective, the combination of independent nasal molding and early functional reconstruction represents a patient-centered approach that prioritizes both anatomical correction and quality of life. Long-term follow-up of PNAM

with vomer flap combination strategy is required to depict the longitudinal growth related anatomical outcomes and whether this combination actually reduces the burden of care and fiscal cost. Moreover, prospective studies involving larger cohorts and long-term follow-up are required to evaluate growth, speech outcomes, and the future need for secondary palatal surgeries This report describes a multidisciplinary treatment protocol integrating independent forehead-anchored nasal molding, conventional alveolar molding, primary lip repair, and simultaneous vomer flap closure in a patient with complete unilateral cleft lip and palate. The approach achieved favorable anatomical correction while simultaneously improving feeding function and eliminating a prolonged dependence on a feeding plate. The technique represents a low-cost, reproducible alternative that may be particularly valuable in resource-constrained cleft centers.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge Mr. Nadeem Hussain, Dental Laboratory Technician, for his outstanding contribution to the development of the modified independent nasal molding appliance described in this report. Translating a novel clinical concept into a functional appliance required numerous redesigns and repeated fabrication attempts. His dedication and patience during the process of refining the appliance until the desired clinical objectives were achieved played a critical role in the outcome of this case.

Conflict of Interest: None.

Funding Source: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

ST & U: Data acquisition, data analysis, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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(6): 486-98. https://doi.org/10.1597/15451569_1999_036_0486_pnmiiw_2.3.co_2
2. Zheng J, He H, Kuang W, Yuan W. Presurgical nasoalveolar molding with 3D printing for a patient with unilateral cleft lip, alveolus, and palate. Am J Orthod Dentofacial Orthop 2019 ; 156(3): 412-419. https://doi.org/10.1016/j.ajodo.2018.04.031
3. Houkes RP, Hens G, Kubon C, Heliövaara A, Dávidovics K, Akota I, et al. Learnability of the LAHSHAL Classification for Oral Clefts: Results of an International Webinar. J Craniofac Surg 2025; 36(8): 3032-3035. https://doi.org/10.1097/SCS.0000000000011355
4. Adetayo AM, Adetayo MO, Adeyemo WL, James OO, Adeyemi MO. Unilateral cleft lip: evaluation and comparison of treatment outcome with two surgical techniques based on qualitative (subject/guardian and professional) assessment. J Korean Assoc Oral Maxillofac Surg 2019; 45(3): 141-151. https://doi.org/10.5125/jkaoms.2019.45.3.141
5. Hao J, Wan Q, Liu J, Wu W, Liu J, Luo C, et al. Modified presurgical nasoalveolar molding for patients with neonatal complete bilateral cleft lip and palate having a severely malpositioned premaxilla. Am J Transl Res 2022; 14(6): 3988-3994.
6. Bajaj A, Rao KS, Sharma SM, Shetty V. Modified presurgical nasoalveolar molding in the infants with complete unilateral cleft lip and palate: a stepwise approach. J Maxillofac Oral Surg 2011; 10(3): 275-280. https://doi.org/10.1007/s12663-011-0232-y
7. Punga R, Sharma SM. Presurgical orthopaedic nasoalveolar molding in cleft lip and palate infants: a comparative evaluation of cases done with and without nasal stents. J Maxillofac Oral Surg 2013; 12(3): 273-288. https://doi.org/10.1007/s12663-012-0434-y
8. 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): 486-498. https://doi.org/10.1597/15451569_1999_036_0486_pnmiiw_2.3.co_2
9. Batra P, Datana S, Arora,A. Presurgical infant orthopedics: A developmental and clinical evolution. J Cleft Lip Palate Craniofac Anomal 2022; 9(1): 101–109. https://doi.org/10.4103/jclpca.jclpca_40_21