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INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/24173
DOI URL: <http://dx.doi.org/10.21474/IJAR01/24173>



RESEARCH ARTICLE

FROM DEFORMITY TO SYMMETRY: A CASE REPORT ON PRESURGICAL NASOALVEOLAR MOULDING IN BILATERAL CLEFT REHABILITATION

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Manuscript Info

Manuscript History

Received: 10 July 2026

Final Accepted: 12 August 2026

Published: September 2026

Key words:-

Bilateral cleft lip and palate; nasal cartilage; nasoalveolar moulding; presurgical orthopaedic treatment; premaxilla;

Abstract

Bilateral cleft lip and palate presents with complex three-dimensional deformities involving the alveolar segments, nasal cartilage, and lip, posing significant challenges for primary surgical repair. Presurgical Naso alveolar moulding (NAM) is a non-surgical orthopaedic technique that aims to reduce the severity of the cleft deformity by approximating the alveolar segments and moulding the nasal cartilages before surgical intervention. A newborn with a bilateral complete cleft lip and palate was referred for presurgical orthopaedic management. Clinical examination revealed a wide alveolar cleft with protrusion of the premaxillary segment and significant bilateral nasal deformity. A customized NAM appliance was fabricated such that the premaxillary segment and palatal segment of the plate were constructed as a separate unit only attached by 0.5mm stainless steel wire which could be activated to reposition the severely deviated premaxilla to the midline and also approximate the alveolar segments, and improve nasal symmetry. Progressive adjustments resulted in reduction of the alveolar cleft width, improved positioning of the premaxillary segment, elevation and moulding of the nasal cartilages, and enhanced columellar length. The improved presurgical morphology facilitated approximation of the lip and nasal tissues during subsequent surgical repair.

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Introduction:-

Cleft lip and palate (CLP) is a congenital craniofacial anomaly resulting from failure of normal fusion of the facial processes during embryogenesis. Bilateral complete cleft lip and palate (BCLP) represents one of the most severe forms of the deformity and is characterized by discontinuity of the lip, alveolus, and palate, with varying degrees of premaxillary protrusion, alveolar segment discrepancy, nasal asymmetry, and deficient columellar projection [1,2]. Presurgical infant orthopaedics aims to modify the relationship of the cleft segments before definitive surgical repair. Naso alveolar moulding (NAM), introduced as an advancement over conventional presurgical orthopaedic approaches, combines intraoral alveolar moulding with controlled nasal cartilage repositioning [3,4]. Progressive presurgical modification of these structures can improve the alignment and morphology of the cleft components and facilitate surgical approximation of the lip and nasal tissues [3,4].

However, treatment requires early initiation, periodic appliance modification, and close multidisciplinary monitoring. The present case report describes the presurgical management of an infant with BCLP using NAM, with

emphasis on the sequential changes in premaxillary position, alveolar cleft approximation, and nasal morphology achieved before definitive surgical repair.

Case Report:-

Patient Presentation:-

A 19-day-old infant was referred to the Department of Pediatric Dentistry for evaluation and presurgical orthopedic management of a congenital cleft lip and palate. Extraoral examination revealed an evident cleft of the upper lip with associated alteration of the nasal contour. Intraoral examination demonstrated a cleft involving the maxillary alveolar and palatal regions, with displacement of the maxillary segments and communication between the oral and nasal cavities. The infant was otherwise clinically suitable for presurgical orthopedic intervention. The parents were informed regarding the nature of the anomaly, objectives of NAM, expected treatment duration, appliance maintenance, feeding considerations, and the importance of regular follow-up. Informed consent was obtained from the parents.



Figure 1:Pre-op image of the patient front view



Figure 2: Pre-op image of the patient (intra-oral view)



Figure 3: Pre-op image of the patient (side profile view)

Treatment Procedure:-

Bonnet and Strap Appliance:-

A bonnet-and-strap appliance was provided to apply gentle downward traction to the displaced, unattached central portion of the upper lip, thereby facilitating its approximation toward the alveolar segments and improving the lip contour prior to definitive presurgical molding.



Figure 4: Bonnet-and-strap appliance with acrylic button for anterior traction mechanism for inferior repositioning of the displaced prolabium.

Initial Impression and Assessment:-

An impression of the maxillary arch was obtained using an appropriate infant impression technique with adequate precautions to prevent airway compromise. The impression demonstrated the configuration of the cleft and the relationship of the maxillary segments.

Fabrication of the Molding Plate:-

A maxillary moulding plate was fabricated on the working cast. All the alveolar cleft gaps and palatal cleft gaps were blocked with plasticine. A cover plate was prepared over the blocked out maxillary cast. Then the premaxillary segment and the palatal part was separated by sawing along the cleft lines. Two stainless steel wires 0.5mm diameter was used to connect the premaxillary part and the palatal part. The nasal stents are made of 0.8mm round stainless-

steel wires and embedded into the palatal plate. The end of the nasal stent wires are bent to form kidney shaped bulbs and are covered with soft silicone resins. The nasal bulbs enter 2-3 mm in the nostrils and are designed to lift the nasal domes. First a prolabium tape with two red elastics looped with each other is adhered over the philtrum. A horizontal lip tape is placed over the prolabium tape spanning from the right side to the left side. The red elastics engage the nasal stent wires. A denture adhesive may assist in achieving proper retention. The hole in the posterior part of the palate prevent airway obstruction in case of accidental dislodgement.



FIGURE 5: the modified plate



figure 6: the appliance in situ

Sequential Molding Protocol:-

Following adaptation to the appliance, active molding was initiated. At each follow-up appointment,

The moulding plate was carefully examined for:

- Retention and stability
- Adaptation to the oral tissues
- Evidence of mucosal irritation
- Relationship of the alveolar segments
- Changes in cleft width and configuration
- Lip and nasal tissue response
- Feeding tolerance

Instead of fabricating a new appliance at every stage, the existing molding plate was progressively modified using a soft liner. A controlled amount of soft liner was added selectively to anterior alveolar fitting surface of the premaxillary part of the plate. After polymerization and appropriate finishing, the molding surface was carefully contoured. The added material provided gentle pressure and guidance to the tissues in the desired direction.

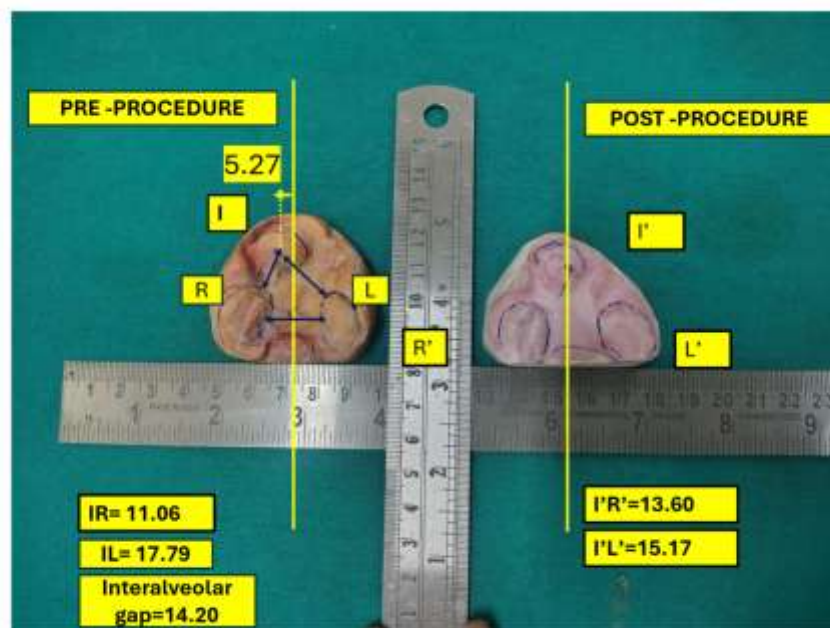


Figure 7: the changes produced are as shown according to Image J software[all dimensions given in millimeters].



Figure 8: The extraoral changes



Figure 9: post-surgical photo after few months

Discussion:-

Presurgical NAM is based on the principle that the neonatal craniofacial tissues possess a degree of plasticity that permits their modification through controlled orthopedic forces [5]. Early initiation of treatment is therefore considered advantageous, particularly when molding is commenced during the first few weeks of life. In the present case, treatment was initiated at 19 days of age, allowing the molding procedure to be undertaken during the early neonatal period. The clinical photographs demonstrate that the molding plate could be adapted progressively as the relationship of the cleft segments changed. A distinctive feature of this case was the use of a plate with distinct premaxillary part and palatal part attached by 0.5mm stainless steel wire. They were activated to shift the extremely deviated maxilla to the midline and also sequential soft-liner modification of the same molding plate was carried out to achieve the desired alignment, as advocated by Jiansuo Hao et al.[6]. The prolabium taping as recommended by Grayson and Shetye have contributed to lengthening of the columella and retraction of the premaxillary segment[7]. However, careful monitoring is essential because excessive or improperly positioned material may produce

undesirable pressure and mucosal irritation. An important objective of presurgical moulding is to create a more favourable preoperative relationship of the alveolar, lip, and nasal structures. Approximation of the cleft segments may reduce the tension required during surgical closure and potentially facilitate the surgical procedure. The serial photographs in the present case provide visual evidence of progressive changes following initiation of the moulding protocol. The improvement in alveolar approximation and external soft-tissue contour suggests that individualized, sequential modification of the moulding plate can be clinically useful. Parental cooperation is another critical component of NAM therapy. The parents in this case were instructed regarding appliance placement, retention, cleaning, feeding, and follow-up. Regular appointments permitted continuous evaluation and modification of the appliance in accordance with the infant's growth and tissue response.

Conclusion:-

This case demonstrates the clinical application of early presurgical Naso alveolar molding in a 19-day-old infant with cleft lip and palate. The use of a Bonnet and strap appliance for initial retraction of the premaxillary segment, combined with a modified plate with a 0.5mm wire connecting the premaxillary and palatal part of the plate which was activated for correcting the deviated premaxilla and sequential modification of the moulding plate using soft liner at each appointment, provided a simple and adaptable approach for progressive moulding of the cleft anatomy. Serial clinical evaluation demonstrated favourable changes in the approximation of the alveolar segments, upper-lip contour, and nasal morphology. The technique emphasizes the importance of early intervention, controlled tissue moulding, individualized appliance modification, and regular follow-up in the presurgical management of infants with cleft lip and palate.

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