Optimizing Cleft Rehabilitation: A Case Report on Early Nasoalveolar Molding and Feeding Modifications

Dr. Revati Abhijit Bhuibhar,[1] Dr. Bhagyashri Thombare,[2] Dr. Aparna Barabde,[3]
Dr. Brajesh Dammani,[4] Dr. Bhushan Wankhade[5]

1 PG student, Dept. of Prosthodontics
2 Reader, Dept. of Prosthodontics
3 HOD and Professor, Dept. of Prosthodontics
4 Professor, Dept. of Prosthodontics
5 Reader, Dept of Prosthodontics

VYWS Dental College, Amravati

Abstract: Cleft lip and palate are common congenital craniofacial anomalies that pose significant functional and psychological challenges, including feeding difficulties, malnutrition, and parental distress. Early intervention plays a crucial role in managing unilateral cleft lip and palate, particularly through presurgical nasoalveolar molding (PNAM) and modified feeding techniques. This case describes a four-day-old female neonate with a complete unilateral left-sided cleft lip, alveolus, and palate extending to the uvula, brought to the Department of Prosthodontics and Crown and Bridge, VYWS Dental College and Hospital, Amravati. The primary parental concerns were facial deformity and feeding difficulties. PNAM therapy was initiated to gradually approximate the cleft segments, improving nasal and alveolar alignment before surgery, while a modified feeding bottle technique was introduced to enhance feeding efficiency and ensure adequate nutrition through the procedure. Early intervention with PNAM and feeding modifications significantly improves surgical, functional, and aesthetic outcomes, reduces the severity of cleft deformities, and minimizes the need for secondary surgeries. Additionally, these interventions provide psychosocial relief to parents by addressing feeding and aesthetic concerns early. A multidisciplinary approach is essential for comprehensive cleft rehabilitation, ensuring better long-term outcomes for affected infants.

Keywords: Pre-surgical nasoalveolar molding, cleft lip and palate, congenital anomalies, infant feeding bottle.

Introduction: Cleft lip and palate is the most common congenital craniofacial anomaly caused by abnormal facial development during gestation.[1] It is the second most common congenital deformity with 01 in 750 births affected with it. Problems of cleft can be related to esthetic, phonetics, functional insufficiency, emotional, psychological and social.[2] Cleft lip and alveolar deformity are associated with abnormality in nasal cartilage morphology and asymmetry of alar base and columella.[3] A particular challenge to surgeons is the correction of the deficient columella and the deformity of the nasal cartilages with acceptable esthetics. The nasoalveolar molding has resulted in long-term benefits to the child.[4]

Presurgical Nasoalveolar Molding: The primary aim of PNAM is a reduction in the soft tissue and cartilaginous cleft deformity to facilitate surgical soft tissue repair in optimal conditions under minimum tension to minimize scar cartilage.[5,6] It allows stimulation and redirection of growth for the controlled predictable repositioning of the alveolar segments and gives the ideal arch form, normalizes the tongue position, aids in speech development, improves appearance and gives a psychosocial boost, and improves feeding and bone contour.[7]

Objectives of presurgical nasoalveolar moulding:

- To provide symmetry to severely deformed nasal cartilages

- To achieve projection of the flattened nasal tip
- To provide nonsurgical elongation of the columella
- To improve the alignment of the alveolar ridges and reduce the distance between the cleft lip segments.[8]

Modified feeding bottle: Infants born with cleft lip and palate face significant feeding challenges due to their inability to generate sufficient suction, leading to inadequate nutrition and potential delays in surgical intervention. Proper nutritional intake is crucial, as timely surgical repair depends on meeting specific health criteria. Cleft lip repair is typically performed between 4–6 months of age, following the "rule of ten" (10 weeks old, 10 pounds in weight, and 10 mg/dL hemoglobin), while cleft palate repair is recommended between 9–15 months, ideally

(a) View from above

(a) View from above

before the onset of speech development. To ensure effective feeding, infants should be positioned upright to minimize choking risks, with feeding sessions scheduled at least 8–12 times per day. Specialized feeding bottles, such as Dr. Brown's, Medela, Mead Johnson, and Pigeon bottles and nipples, are available, though accessibility may be a challenge in some regions. In such cases, alternative feeding methods like spoon-feeding, droppers, or nasogastric tubes may be necessary. Modified feeding bottles with obturators can assist in creating intraoral pressure for proper suction and swallowing, but due to continuous jaw growth, these require regular adjustments every 1–2 weeks. These feeding bottles also support the Presurgical Nasoalveolar Molding (PNAM) procedure, which aids in feeding difficulties and prepares the infant for surgery. Postoperatively, bottle feeding should be avoided to prevent complications such as bleeding or suture dehiscence. Parental education is essential in ensuring proper feeding techniques, frequent burping, meticulous oral hygiene, and thorough sterilization of feeding equipment, ultimately optimizing the infant's nutrition and ensuring successful surgical outcomes.

Modified Feeding Bottle

Case report:

Case history, Examination and diagnosis: A 4-day-old female infant born prematurely at 35 weeks, weighs 1.36 kg suffering from complete unilateral left cleft lip and palate extending up to the uvula was brought to Department of Prosthodontics at V.Y.W.S Dental College And Hospital Amravati for evaluation and treatment A general physical examination was carried out under supervision of physician and consent was obtained to start the modeling procedure in the first week of birth. There is no significant family history, nor any maternal history of drug ingestion, vitamin deficiencies, psychological, emotional traumatic stress during pregnancy. (Figure 1: Extraoral view) (Figure 2 ,3: Intraoral view).

Figure 1: Extraoral view

Figure 2 and 3_Intraoral view

Impression and fabrication of oral molding appliance: After evaluation and a thorough explanation of the treatment goal and procedure to the parents, a primary impression of intraoral cleft defect was made using impression compound with the infant fully awake and without any anesthesia in clinical setting prepared to handle any emergency, impression was obtained which was followed by primary cast. A custom tray was fabricated in clear auto polymerizing acrylic resin on the primary cast (Figure 4) using which final impression was made in

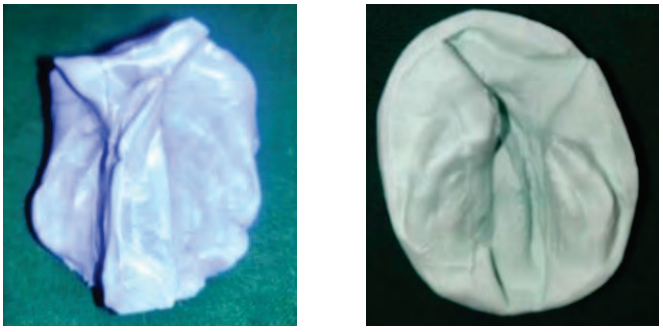
Preliminary impression made with impression compound on operator's thumb

Primary cast made

Custom tray fabricated in clear auto polymerizing acrylic resin

Figure 4

addition silicone putty material with infant held in a upside down position by the operator and impression tray was inserted into oral cavity, maintaining the position to keep tongue forward allowing fluids to flow out the oral cavity. Once impression is made the tray was removed and oral cavity is examined for any residual impression material and impression was then poured in gypsum type III and final cast is achieved (Figure5). The size of defect was measured at base of alveolus on cast using a venier caliper and was found to be 11mm.

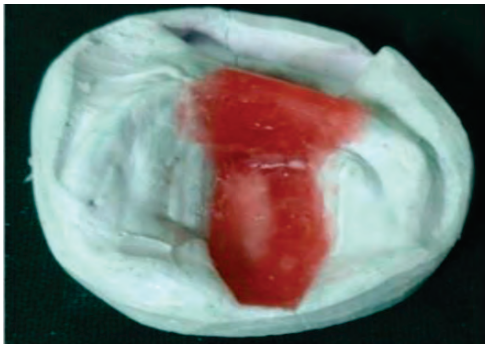


Final impression made in addition silicone putty material

Final cast

Figure 5

The cleft region of the palate and alveolus was filled with baseplate wax to approximate the contours and topography of an intact arch before the fabrication of oral molding molding appliance and a base plate using 2 to 3 mm of thickness of baseplate wax along with a retentive button was made (Figure 6) Fabricated using clear heat cure acrylic resin (Figure7).



- Cast prepared for fabrication of alveolar tunnel in the plate.
- Blocking the defect with wax.

Figure 6

- Retentive button is attached at the middle of the defect which is marked intraorally.
- It is attached at 45° angle to the maxillary plane

Figure 7

The appliance was finished and polished to ensure that all borders were smooth. At the appointment, the device was carefully fitted in infant's oral cavity and observed, infant was able to suckle without gagging or struggling.

Retention and adjustment of the PNAM appliance: An extraoral retentive button was fabricated using self-polymerizing clear acrylic resin and positioned at a 45° angle on the labial flange to ensure proper clearance for the lips and secure seating of the appliance. The device was externally stabilized using surgical tapes and orthodontic elastics, with skin barrier dressing tapes (Tegaderm) applied to prevent cheek irritation.

For proper retention, a broader base tape was placed on the infant's cheeks, anchoring thinner tapes that secured the appliance. Orthodontic elastics were looped and attached to the retentive button, providing a controlled activation force (~100 g). These tapes and elastics were replaced regularly to maintain appliance stability. (Figure8)

Materials used for taping the appliance

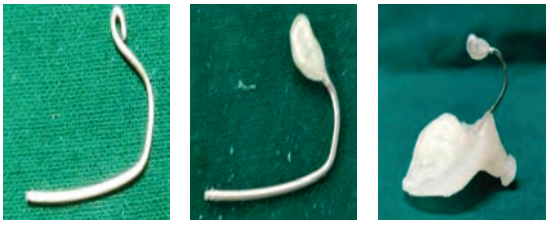
Figure 8

Parents were instructed on lip taping techniques, provided with materials, and scheduled for weekly follow-ups.

During each visit. The oral cavity was checked for sores, inflammation, or ulcerations. The appliance was cleaned and adjusted as needed. Selective pressure modifications were made using permanent soft liner to guide alveolar segments into alignment. Adjustments were made every 2–3 weeks, gradually reducing the cleft gap and shaping the maxillary alveolar arch for optimal surgical outcomes.

Nasal stent in PNAM therapy: The active phase of nasal cartilage molding in presurgical nasoalveolar molding (PNAM) began when the intraalveolar gap reduced to around 6 mm. At this stage, a nasal stent was incorporated to improve nasal and lip alignment.

A 0.019-inch stainless steel wire nasal stent was attached to the appliance, shaped in a "swan neck" configuration for stability and lip taping access. The intranasal portion included a bilobed acrylic component for structural support, with a soft liner ensuring controlled tissue pressure. Weekly adjustments guided the molding of the nasoalveolar complex. (Figure 9a & 9b)



Swan shaped nasal stent of 19 gauge wire

Kidney shaped acrylic over the tip of the wire lined with soft liner

Nasal stent attached to the appliance with auto polymerizing acrylic resin

Figure 9a

Figure 9b

After three months, the alveolar gap was reduced to 1.5–2 mm, ensuring optimal segment alignment. With improved nasal and philtrum structure, the infant was scheduled for surgical repair (Figure 10).

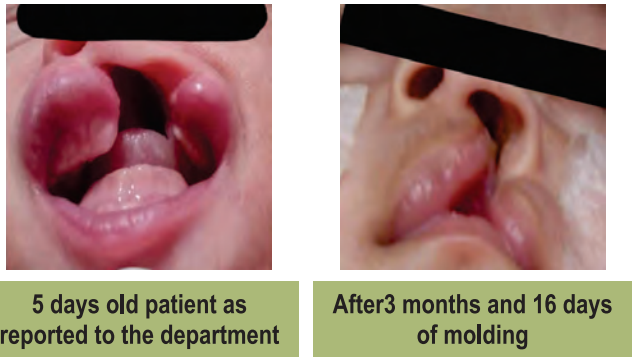


Figure 10: Post PNAM treatment

Surgical procedure: At four months, primary lip and nose closure was performed, aided by PNAM, simplified alveolar and palatal closure. At 18 months, a second surgery ensured complete palatal closure with minimal scarring, achieving a natural facial appearance which can be appreciated in the figure below (Figure 11).

Figure 11

Dicussion: Infants born with oral clefts often experience malnutrition, anemia, and low birth weight, which can delay early surgical intervention. Nasal and alveolar molding (NAM) techniques have been widely recognized for their positive impact on pre-surgical cleft repairs, reducing muscle tension and defect size.

While feeding plates are commonly introduced shortly after birth, reports on early nasal molding within the first week are scarce. The authors hypothesized that early nasal molding could provide a more stable long-term outcome with minimal relapse. Studies, including those by Punga et al., indicate that incorporating nasal stents into the PNAM plate leads to significant improvements in columellar height and nasal tip projection. This highlights the essential role of early nasal molding in achieving better surgical outcomes and facial aesthetics for infants with cleft lip and palate.

Conclusion: Early nasal and alveolar molding (NAM) plays a crucial role in optimizing surgical outcomes for infants with cleft lip and palate. By initiating nasal molding within the first week of life, alongside passive NAM plates and lip taping, significant improvements in nasal symmetry, columellar height, and alveolar alignment can be achieved. Additionally, the use of modified feeding bottles helps address feeding difficulties by improving suction, reducing nasal regurgitation, and ensuring adequate nutrition, which is crucial for weight gain and early surgical intervention. The combination of these techniques not only enhances facial aesthetics but also reduces surgical tension and the risk of relapse. Given the promising results observed in recent studies, early nasal molding and feeding modifications should be considered essential components of pre-surgical cleft management.

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