

# Pre-Surgical Management of Unilateral Cleft Lip and Palate in a Neonate: A Clinical Report

Sujoy Banerjee · Rajlakshmi Banerjee ·  
Usha M. Radke · Darshana Mundhe

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**Abstract** Cleft lip and palate deformity is a congenital defect of the middle third of the face, consisting of fissures of the upper lip and/or palate. Naso-alveolar molding provides excellent results when considered and started early in the neonatal. Early treatment is important not only due to esthetic and functional concerns, but also for a positive psychological impact it has on the child. In the pre-surgical management, an interdisciplinary approach is necessary where an Orthodontist and a Prosthodontist play a major role. Also any treatment procedure in an infant becomes difficult due to the lack of co-operation from the child. This clinical report describes the multidisciplinary approach for complete pre-surgical management of a neonate with complete unilateral cleft of soft palate, hard palate, alveolar ridge and lip.

**Keywords** Cleft lip and palate · Feeding device · Pre surgical naso-alveolar molding

## Introduction

Cleft lip and palate is a congenital defect of the middle third of the face, characterised mainly by presence of

oronasal communication, malformation or agenesis of the teeth close to the cleft and deficient sagittal and transverse growth of the maxilla [1]. Prevalence varies from 1:500 to 1:2500 live births. Cleft lip occurs in 20–30% cases, cleft lip and palate in 35–50% cases and cleft palate alone in 30–45% cases. The aetiology is complex and depends on genetic and environmental factors Treatment is important not only due to esthetic and functional concerns, but also because it brings about a positive psychological impact on the patient. Treatment planning for patients with cleft lip and palate is related to many factors like the age and socioeconomic status of the patient, type and severity of the defect and the intraoral situation at the time treatment is planned. In such cases, a multidisciplinary approach is necessary to evaluate, diagnose and resolve functional and esthetic problems. The cleft results in problems of suckling as there is no lip seal achieved and due to the oro-nasal communication. It can lead to severe nutritional as well as respiratory problems if not taken care of early. As the child grows the effect on the speech, occlusion and looks becomes more evident. Presurgical naso-alveolar molding [2] is an excellent treatment modality which depends on the inherent plasticity and moldability of the neonatal cartilaginous tissues and greatly improves the final outcome after surgical treatment.

## Clinical Report

A 3 day old neonate suffering from complete unilateral cleft lip and palate presented to Department of Prosthetic Dentistry of V.S.P.M's Dental College and Research Centre, Nagpur for evaluation and treatment. Prior to treatment, detailed medical, dental and social history was obtained from the patient's parents. The neonate was the

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S. Banerjee  
Department of Orthodontics, VSPM's Dental College  
and Research Centre, Nagpur, India

R. Banerjee · U. M. Radke · D. Mundhe  
Department of Prosthodontics, VSPM's Dental College  
and Research Centre, Nagpur, India

R. Banerjee (✉)  
A-103, Ganesh Towers, Bharat Nagar, Amravati Road,  
Nagpur 440033, Maharashtra, India  
e-mail: drrajlakshmi1@rediffmail.com

**Fig. 1 a** A child on presentation. **b** Intraoral defect involving the soft palate



first prime born full term with normal vacuum delivery. There was no history of infection, drug ingestion, vitamin deficiencies, and psychological, emotional or traumatic stress during pregnancy. Family history was positive with mother's younger brother being victim of same developmental disorder. The neonate on presentation had low birth weight, low set ears and sepsis (Fig. 1a) and was on intravenous fluids and antibiotics. Other systemic abnormalities were absent. Intraoral examination revealed complete unilateral cleft of right side involving soft palate, hard palate, alveolus and lip (Fig. 1b). After thorough examination, the defect was diagnosed as complete unilateral cleft of hereditary origin.

Due to the patient's complex condition, which included complete unilateral cleft and sepsis and considering his age; definitive treatment (surgery) was contraindicated. Therefore, a treatment plan was developed with the aim of improving the functional ability (suckling) and developing proper tongue position with the help of a feeding plate. Presurgical nasopalveolar molding was the subsequent best possible treatment choice prior to surgery which would guide growth and development of the palatal segments reducing the size of cleft of the alveolus and palate.

After thorough explanation of the procedure and treatment goals to the parents, impression of the intraoral cleft defect and surrounding normal tissues was made using heavy body polyvinyl siloxane impression material (Aquasil, Dentsply Corporation, Germany) [2]. The neonate was kept nil by mouth for 30 min before making the impression. A spoon was used to carry the impression material. The procedure was done in the presence of an anaesthetist to be available in case of any emergency during the impression making. The infant was fully awake, without anaesthesia, and was held face down to prevent possible aspiration of the impression material and regurgitation of stomach contents. Head was gently held in a slightly upright position during the impression procedure [2]. Care was taken to ensure that the material has registered the border regions of the maxilla as well as cleft region. When the material had fully set, impression was

removed and inspected to ensure that all desired landmarks had been captured (Fig. 2). Impression was, then poured in type IV dental stone (Kalrock, Kalabhai Karson Pvt. Ltd) and the cast was recovered (Fig. 3). Undercuts were blocked using plaster-pumice mix. Modified cast was then



**Fig. 2** The completed impression



**Fig. 3** Recovered cast

lubricated with a thin layer of petroleum jelly. The cleft region of palate and alveolus were filled in with wax to approximate the contour and topography of an intact arch. Waxing was done to incorporate the full extension and thickness of cast as determined from the impression. Also, an extraoral retentive button was developed in wax and incorporated at the site of cleft in the lip. After finishing and polishing of the waxed plate, feeding plate was fabricated using heat polymerised clear acrylic resin (DPI) in the conventional manner. The appliance was finished and polished to ensure that all borders, tissue surface as well as oral portion of the appliance that will be in contact with the dorsum of the tongue were smooth. The retentive button was trimmed to be at an angle of  $45^\circ$  in upward direction to the occlusal plane. Using a round bur, hole was made in the centre of the retentive button for incorporation of elastics. Two stretchable elastic threads were passed through the hole and tied on either side and were wrapped with micropore adhesive (Fig. 4) [3].

At the insertion appointment, the appliance was carefully fitted in the neonate's oral cavity and retained extraorally by incorporating the elastics between the adhesives (micropore and dynaplast) (Fig. 5). After initially inserting the plate, the neonate was observed for few minutes. The neonate was able to suckle without gagging or struggling. Instructions for insertion, removal and cleanliness of the appliance were given to the caretakers. Instructions were given to keep plate in oral cavity for 24 h except during cleaning.

#### Fabrication of the PNAM Plate [4]

Fifteen days after the insertion of the feeding plate and improvement in systemic condition, a custom tray was



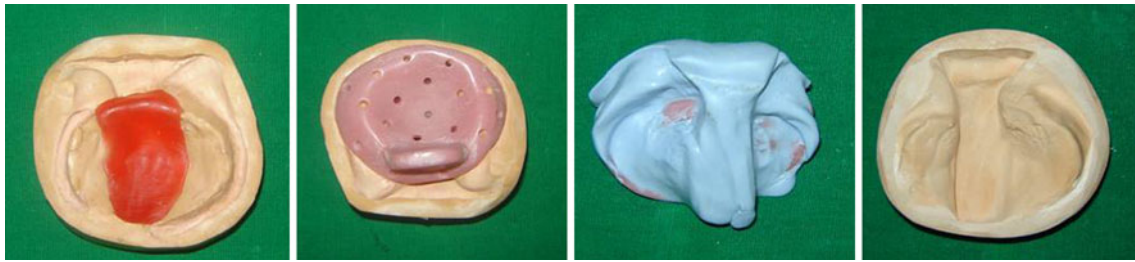
**Fig. 4** Finished appliance with stretchable elastics



**Fig. 5** Feeding plate secured in neonates oral cavity with extraoral elastics and adhesives

fabricated over the previous cast after blocking the undercut and the cleft region using plaster-pumice mix and wax to approximate the contour and topography of an intact arch (Fig. 6). The tray was finished and polished. After evaluating the extensions of the tray intraorally it was perforated using round steel bur and handpiece. Tray adhesive was applied and final impression was made of the cleft region and surrounding normal tissues using heavy body polyvinylsiloxane (Aquasil, Dentsply Corporation, Germany) and the final cast was obtained. Greater and lesser segments were demarcated on the cleft region was blocked to approximately three fourth of its depth and four layers of tin foil were adapted on the greater and lesser segments respectively. Molding plate was waxed over these using two layers of modelling wax (Fig. 7) and the plate was fabricated using clear heat polymerised acrylic resin in the conventional manner. After finishing and polishing, fit of the plate was evaluated intraorally and a 5 mm diameter hole was made in the centre and posterior part of the plate using round steel bur (Fig. 8), to maintain airway patency in case of an airway emergency.

Extraoral retentive button was then fabricated using self polymerised clear acrylic resin and attached at the site of the cleft in the lip. The extraoral retentive button was positioned facing downward on the labial flange at a  $45^\circ$  angle to the occlusal plane. 1–1.5 mm deep groove was made at the centre of the retentive button for the incorporation of the elastics. Fit of the plate was again verified and tissue surface modified to begin molding. Molding was achieved by adding Permasoft [5] 1–1.5 mm (GC Corporation, Japan) to the inner surface of the labial aspect of the alveolus portion of the appliance while reducing acrylic from the palatal aspect of the appliance, this directs the greater segment inwards. For the lesser segment, acrylic is



**Fig. 6** Cleft region filled with wax to fabricate the tray for making the impression and the recovered cast

**Fig. 7** Greater and lesser segments demarcated tin foil adapted and wax up done for plate fabrication



**Fig. 8** Tissue surface of molding plate

selectively removed from the inner labial aspect of the lesser segment of the alveolus (approximately 1–1.5 mm) and adding equal amount of liner on the palatal aspect of the alveolus in the lesser segment, this directs the lesser segment outwards from the cleft.

Plate was then inserted and retained extraorally. For retentive taping, broader base tape of Steri-Strip (0.5 × 1.5 inch) (3 M, St Paul, MN) was first applied to the infant's cheek lateral and superior to the commissures. These base tapes anchor thinner Steri-Strips (0.25 × 4 inch) that hold the appliance against the palate. Small red orthodontic elastics (0.25 inch diameter) were incorporated into loops of thinner Steri-Strips that are folded over them.

The elastic bands were placed over the retentive button and the strips pulled and secured to the base tapes.

The neonate was observed for sometime after inserting the plate to check airway patency. Lip taping was also done at the initial insertion appointment (Fig. 9). Parents were trained to insert, tape, remove and clean the appliance. Instructions were given to keep plate in oral cavity for 24 h except during cleaning. Base tapes can be kept for a longer time but thinner strips should be changed daily. Patient was recalled on a weekly basis and minor adjustments were made. Patient was asked to wear this appliance till the cleft gap is reduced to approximately 6 mm or less, after which nasal stent was added and phase of active nasal cartilage molding [6] was begun with the addition of a wire loop bent in a swan neck fashion and added to the upper end of the retentive button (Fig. 10). The loop on the end of the wire was coated with permasoft to prevent any injury to the nasal soft tissues. The NAM plate with the nasal stent attached was inserted and gentle pressure was applied to the depressed alar cartilage by activating the wire loop (Fig. 11), and an upward molding of the nasal cartilage was done giving a more symmetrical nasal form.

## Discussion

Treatment planning in cleft lip and palate deformity depends on age, socioeconomic status, type and severity of defect as well as intraoral situation at the time treatment is planned. For cleft lip and palate deformity treatment depends on presurgical orthopaedics, surgical repair and



**Fig. 9** Infant with the molding plate retained extraorally and lip taping done



**Fig. 10** The nasal stent added

orthodontic treatment as well as may require removable or fixed prosthesis as definitive treatments in the later phase. Naso alveolar molding has been found to be an effective presurgical treatment step. It uses the inherent molding capacity of the neonatal cartilaginous tissues due to the increased levels of hyaluronic acid found circulating in the neonatal tissues till about 45 days even after birth [6]. Surgical repair is normally done at 3 months after birth for cleft lip and at the age of 15–18 months for cleft palate [3]. Thereby presurgical nasoalveolar molding during this phase before surgical repair helps to bring the cleft lip and palate segments as close as possible and makes surgery easy as well as gives maximum esthetics.

Presurgical nasoalveolar molding provides following advantages [6]:



**Fig. 11** The child with naso-alveolar molding appliance

- Improves feeding
- Guides growth and development of palatal segments
- Normalizes tongue position resulting in better speech later
- Minimizes extent of surgery by reducing size of cleft
- Reduces number of surgeries
- Improves esthetics
- Provides positive psychological impact on the parents.

Elastomeric impression material used exhibits excellent tear strength and can yield two or more casts without significant distortion. Blocking cleft to three fourth of its depth allows the palatal segments to move uninterrupted. The tin foils adapted provide space for addition of the relining material. The sequential modification of the molding plate reduces the size of the cleft gap and helps approximate the palatal segments to a proper maxillary arch form. Extraoral retentive button facilitates positive seating of the appliance to the palatal tissues and helps to secure the retentive lip tapes and elastic bands. The position of the retentive button (45° downward to the occlusal plane) allows clearance of the upper and lower lips [7]. The molding plate not only allows presurgical nasoalveolar molding but it also enables the infant to suckle milk solving a major problem of feeding.

### Summary

This clinical report describes a prosthodontic approach with the fabrication of a molding plate for cleft lip and palate deformity in a neonate. The molding plate



**Fig. 12** The child after 2 months of pre-surgical naso-alveolar molding

successfully rehabilitated the neonate by closing the oro-nasal communication and providing a pseudo-palate. The infant started suckling without any problem and this was correlated with the remarkable improvement in the child's weight and overall nutritional status of the neonate. It also

helped in reducing the size of the cleft as observed from the post molding photographs (Fig. 12) as well as the study casts.

**Conflict of Interest** None

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