

## Pre Surgical Naso-Alveolar Moulding in a Bilateral Cleft Lip and Palate Infant - A Paradigm Shift in Management of Cleft Lip/Palate Defects

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### Abstract

**Introduction:** Cleft lip and palate (CLP) is the most common congenital craniofacial anomaly and its etiology has been attributed to various environmental, genetic and unknown factors.

**Background:** Rehabilitation of CLP generally requires a good team of all specialists. Presurgical nasoalveolar moulding (PSNAM) is a pre-orthopedic treatment which helps in shaping the cleft alveolus, palate, nose and lip components thereby enabling surgeons to achieve maximum results following primary surgery.

**Case Description:** A 27-day-old baby girl with bilateral complete cleft lip and palate reported seeking treatment for the defect. A pre-surgical nasoalveolar molding appliance was given and regular follow-up was done.

**Conclusion:** PNAM reduces the severity of initial alveolar cleft and nasal deformity and thus improves the post-surgical treatment outcome.

**Clinical Significance:** Facial growth problems are encountered with cleft lip and palate such as retrusion of mid face and distortion of the dento-alveolar bone. The management of cleft infants is essential to enhance esthetics which in turn builds social self-esteem in both parents and patients.

**Keywords:** Nasoalveolar Moulding; Bilateral Cleft Lip and Palate; Alveolar Defect; Feeding Plate; PSNAM

### Introduction

Cleft lip/palate is the most common observable congenital defect with a prevalence of one in total of 700 birth rates. India, which is the second most populous country in the world is documented with more than 3500 cleft lip/palate infants, recorded each year [1].

A solution to aid in surgical repair and minimise scarring is Presurgical Nasoalveolar Moulding (PSNAM). PSNAM was developed by Barry Grayson in the year 1993 [2]. It helps in reducing the gap of intra-alveolar cleft region, necessitates soft tissue moulding and improving post-surgical esthetic results and minimizing scars [3]. It is a type of novel pre-orthopedic treatment modality which reshapes the defective part of the nose and alveolar soft tissue in cleft lip/palate infants. The hypothesis behind the use of soft tissue molding seen in PSNAM is due to the presence of increased amount of estrogen values which in turn leads to increase in the level of hyaluronic acid seen

at the time of birth. This hyaluronic acid plays a major role in enhancing the elasticity of the cartilages thereby necessitating easy soft tissue molding.

The suggested advantages of PNAM are many which include better molding of soft tissues in the cleft region. This will in turn help surgeons post-surgically to achieve maximum esthetic results following cheiloplasty and rhinoplasty with minimal scar formation. In addition to these, PSNAM also helps in feeding and improvement in speech and deglutition. In order to achieve the above said benefits it is advised to start the treatment of PSNAM at birth without any delay, because of increased level of hyaluronic acid seen at the time of birth which gradually decreases after six weeks following birth of an infant [4].

### **Case Report**

A 27-day-old baby girl infant having bilateral cleft lip and palate defect was reported (Figure 1). The infant was examined in detail and all preliminary procedures were carried out and finally utilization of PNAM was planned to reshape the cleft defect. In the first week, impression was taken. In the first month, as we see increased level of hyaluronic acid as well as estrogen levels in neonate which is circulated from mother, which help in molding of soft tissues to achieve maximum results. Therefore, the literature shows the treatment using PSNAM should be carried out within 3 - 6 months of infant's age [5].



**Figure 1:** Infant with bilateral cleft lip defect.

An elaborate medical and family history was taken. No history of consanguineous marriage, syndrome or obvious genetic predisposition was implicated. PNAM was suggested as line of treatment till the infant was scheduled for surgery.

### **The impression technique**

With the parental consent, Conventional impression making was planned, as it is an invasive procedure during which the infant is fully awake and not anaesthetized. The initial impression was made using a heavy bodied silicone impression material. The presence of the anaesthetist is highly essential while taking impression to manage any kind of emergencies encountered during the procedure. Impression was made as suggested by Grayson and Maull [6]. According to these authors' experience, while making impression, the infant is placed upside down on mother's or caregiver's or nurse's lap in order to keep the infant's tongue in proper position without posterior displacement and also this position will help in drawing off oral fluids from the oral cavity (Figure 2).



**Figure 2:** Impression making with silicone putty in custom made acrylic tray.

### Appliance fabrication

During appliance fabrication, undercuts seen on the prepared cast were blocked out using utility wax and separating media was applied. The naso-alveolar molding plate was fabricated as shown by Grayson and Maull using hard and self-curing acrylic material. The retention arms were placed approximately at 45 degrees position to achieve proper activation. This will also prevents dislodgement of the appliance from the oral cavity (Figure 3) [7]. The retention arms in vertical position was placed at the intersection of the upper extra-oral tapes; which secures the molding plate in the oral cavity.



**Figure 3:** Fabricated appliance.

### Appliance insertion

The appliance was carefully examined for presence of any rough margins and then they were trimmed and polished before placement in the oral cavity and it was examined for proper fitting and ease of insertion (Figure 4). The primary retention of the appliance was through extra-oral bilateral facial adhesive tapes applied to cheeks and to acrylic extension from oral plate that is positioned between lips under the cleft and at one end orthodontic elastics are attached. The elastics with inner diameter of 0.25 inch was used and was stretched to double of its size or diameter for delivering an activation force of about 2 oz [7,8]. Depending on the clinical purpose and mucosal tolerance the quantity of force used was varied [9].



**Figure 4:** Infant with inserted PSNAM appliance.

Following first initial insertion, the baby was kept under observation for few minutes to check the stability of the appliance in place against the palate. Bottle feeding was advised to check proper suckling of milk without gagging [5]. During final delivery of the appliance, parents were advised to maintain the plate all the time in infant's mouth and regular cleaning of the appliance before placement. Usually, some longer time is taken by infant while feeding with the plate and later on infant gets adjusted. The same was observed in the present case. The retention arms was placed approximately 45 degrees down in order to obtain correct activation and to prevent dislodgement of the appliance from the oral cavity. The tapes were changed once a day [1,4].

### Appliance adjustment

The appliance was placed for a day in the infant's mouth and parents were informed about its placement and removal. After one day, patient was recalled to check for presence of any sore spots or ulcers created from the appliance and they were marked in the appliance and corrected. The infant was recalled once in a week to adjust and modify the molding appliance in order to obtain the molding of alveolar cleft segments into the desired position. This was done by selective trimming and addition of acrylic material wherever required in the molding plate [1,4]. The area where movement to be facilitated was reduced and soft liner material (GC India, Dental Pvt Limited) was added to alveolar region to exert pressure and facilitate moulding and movement of the segments. Since the patient had a rotated maxilla, initial focus was in the de-rotation of the premaxilla which once achieved, further facilitated in drawing the segments closer. Bilateral cleft moulding was carried out by directing the postero-lateral segment outward, de-rotating the premaxilla to inward position in alignment with posterior alveolar segment and closing the alveolar cleft (Figure 5). At 3<sup>rd</sup> appointment, parents were asked to place the tapes and elastics and were strictly cautioned in the maintenance of meticulous hygiene to prevent fungal infection. This procedure was continued for 4 months until de-rotation of the pre-maxilla was achieved and baby weighed about 6 kgs to undergo 1<sup>st</sup> term of surgery [10,11].

### Discussion

Previous studies done on PNAM have shown excellent results [5]. Since the patient presented to us after almost 4 weeks of birth, we couldn't utilise much of the advantage of the moulding attributed by hyaluronic acid (which decreases after 6 weeks). Despite that, an appreciable reduction in alveolar cleft gap with complete de-rotation of pre-maxilla was observed. This finding was in consensus with a study by Shetty, *et al.* as they showed appreciable results despite the initiation of this therapy in infants older than one month [11].



**Figure 5:** Derotation of pre-maxillary segment and decrease in the alveolar cleft gap obtained by PSNAM (A- Preoperative, B- After one week, C- After 6 weeks, D- After 8 weeks).

It must be noted that nasal stent and nasoalveolar moulding is very crucial in bilateral cleft palate correction as compared to unilateral cleft cases, since it facilitates the lengthening of the columella thus eliminating the need for a second surgical procedure.

It is also important to realise that parental compliance is very essential in the success of this procedure as the infant requires wearing the appliance for maximum duration, the parent should be put at ease of its use and explained the need for this therapy. In our case, the parents were motivated by showing the progress of the therapy by means of photographs where they could appreciate the visible changes taking place.

The PSNAM has various benefits; It helps in active reshaping and repositioning of deformed alveolar and nasal cartilages, facilitates lip position thereby reducing the scar formation following secondary surgery. It also lengthens the columella and reduces the requirement of secondary alveolar bone grafts which in turn reduces hospitalization time and cost offered by it. Overall it provides psychological benefit to the whole family [12]. However, there is much debate going on relating to benefits and drawback associated with PSNAM. Those who support this novel approach state that compared to traditional appliances, PSNAM improve final nasal symmetry by lengthening the columella and improve lip aesthetics too. Those researchers who does not go with this concept, speculate that there are chances of dropping out of patients, as this treatment modality is more complex, requires parents compliance, are more expensive so that poor parents cannot afford this and have adverse effect on bone growth. However, none of these claims are evidence-based [13]. Although, due to lack of long term research the stand on the use of PNAM as a compulsory presurgical procedure is disputed. The advantage in achieving nasal symmetry and columella correction/lengthening is unanimous and cannot be overlooked [9]. Moreover, awareness about this novel procedure and in turn referral to concerned specialties is lacking in Indian population [14]. Therefore, creating awareness about this concept is highly essential among all groups including parents, nurses, guardians, medical specialties and even students too.

The few disadvantages are mentioned by some authors about PSNAM. Some-times, this may cause airway obstruction due to improperly seated appliance, can cause expansion of alar rim, can lead to fungal infection and soft tissue irritation leading to soft tissue sores [13]. These drawbacks can be prevented by proper motivation and instruction to the parent and stressing importance of follow up. This can only be achieved by proper parental compliance.

## **Conclusion**

PNAM effectively aids in the reduction of cleft gap and more awareness and long term studies are required to further support these claims.

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