



ISSN NO. 2320-5407

Journal homepage: <http://www.journalijar.com>  
Journal DOI: [10.21474/IJAR01](https://doi.org/10.21474/IJAR01)

**INTERNATIONAL JOURNAL  
OF ADVANCED RESEARCH**

## RESEARCH ARTICLE

### PRESURGICAL NASOALVEOLAR MOULDING.

**Sonia Sivadas<sup>1</sup>, Arathi Rao<sup>2</sup>, Suprabha BS<sup>3</sup>.**

1. Post graduate student, Paedodontics & Preventive Dentistry, Manipal College of Dental Sciences, Manipal University, Mangalore.
2. Professor and Head, Paedodontics & Preventive Dentistry, Manipal College of Dental Sciences, Manipal University, Mangalore.
3. Professor, Paedodontics & Preventive Dentistry, Manipal College of Dental Sciences, Manipal University, Mangalore.

#### Manuscript Info

##### Manuscript History:

Received: 14 February 2016  
Final Accepted: 19 March 2016  
Published Online: April 2016

**Key words:** Cleft Palate,  
nasopalveolar moulding

##### \*Corresponding Author

**Dr. Arathi Rao.**

#### Abstract

Cleft lip and/or palate malformations are the most common congenital abnormalities in the craniofacial region and present a serious problem for health delivery systems throughout the world. The condition requires multiple surgical procedures from birth to maturity and frequent outpatient attendances. Many patients suffer impaired facial growth, dental anomalies, speech disorders, poor hearing, and difficulties in psychological wellbeing and social relationships. Presurgical nasopalveolar moulding consists of selective repositioning by active moulding of the alveolar segments as well as the surrounding soft tissue. Presurgical nasopalveolar moulding (PNAM) involves active moulding and repositioning of the deformed nasal cartilages and alveolar processes as well as the lengthening of the deficient columella.

A basic treatment objective for the cleft lip, alveolus and palate patient is to restore normal anatomy. This includes the nasal components as well. Because of the major hard and soft tissue abnormalities observed in these patients it is highly desirable to restore the correct skeletal, cartilaginous and soft tissue relationships presurgically. This review analyses the concept of nasopalveolar moulding and the evolution of the procedure through the years and its effectiveness in cleft lip/ palate repair.

Copy Right, IJAR, 2016,. All rights reserved.

#### Introduction:-

According to the global epidemiological survey one in every 600 new born children are affected by cleft palate. United States Bureau of Census (2001) quotes that an infant affected with cleft is born each 2.5 minute. Asians exhibit the maximum incidence of cleft palate cases and Africans the least with Caucasians occupying the middle position. Over 3,500 cases of cleft are registered in India per year. (1) The long established management of cleft lip and palate included multiple surgeries. The earliest surgical treatment of cleft palate was documented in AD 317, when Chinese general Wei Yang Chih had his cleft lip amended by incising and sewing the edges of the cleft together. With the advent of newer surgical techniques from the 1800s to 1900s, the focus shifted to achieving precise muscle closure, delicate technique, and a better esthetic result. (2) Since then various authors like Pierre Franco 1556, Tennison 1952, and Millard's technique 1960 have defined the different surgical methods for correction of cleft lip and palate. The concept of presurgical infant orthopedics was developed to enhance the esthetic aspects of cleft lip repair (3)

Typical cleft nasal malformation is seen as a consequent defect that arises in the fetal period secondary to the primary cleft lip and palate deformity presenting as a characteristic abnormal shape or location of the nasal structures. Repeated modification of the nasal malformation would result in increased surgical mutilation and less

than perfect outcomes. Thus, presurgical naso alveolar moulding is a comprehensive non surgical method of correcting cleft lip, palate and nasal defects to a large extent.(4) Cleft lip and palate cases have been treated using presurgical infant orthopaedics since centuries.

The earliest modalities concentrated on retracting the extended premaxilla using elastics, surgical repair after which it was stabilized. It was Hoffmann who established the modality of facial binding for narrowing the cleft and preventing postsurgical dehiscence in the year of 1689. Desault in 1790 introduced a similar technique to draw back the maxilla before it was corrected surgically in patients with bilateral cleft treatment. The significance of presurgical modification of clefts utilizing an adhesive tape binding was emphasized by Hullihen in 1844. The use of a bonnet and strapping for the stabilization of the premaxilla after surgical retraction was introduced by Esmarch and Kowalzig. A silver wire was passed through each end of the segments of the cleft, and then gradually tightened to bring together the edges of the alveolus prior to lip repair, this procedure was established by Brophy in 1927(5).

Presurgical infant orthopaedics encompasses any treatment of an infant's cleft deformity before the definitive primary lip surgery.(6) Since the introduction of presurgical infant orthopaedics in 1950 by McNeil, techniques and their results have been changing. The plastic character of cartilages in the newborn infant is utilized for active shaping and relocation of the nasal cartilages.

In 1984, Matsuo et al explained a procedure to nonsurgically repair congenital auricular deformities, utilizing the plasticity of infant cartilage which is thought to be the result of elevated levels of circulating maternal estrogen in the infant's bloodstream. This concept of making use of the plasticity of infant cartilage was applied to the management of cleft nasal deformity with good results, but the success of the technique depended on an intact nasal floor. The plasticity of infant cartilage is seen in the first 6 months of age gradually converting to a stage of elasticity, maintaining the shape of the nasal cartilage at that point. With this concept of cartilage plasticity and the ability to permanently modify its shape, the concept of NAM was created.(7) Matsuo studied neonatal shaping of the cartilages of the nose using silicone tubes for the moulding process of the nostril.

It was in 1993 that Grayson et al explained an innovative procedure in which the nose, lip and alveolus are shaped prior to surgery in children affected by cleft lip and palate. NAM is a nonsurgical, passive technique of approximating the alveolus and lip by redirection of the potencies of innate growth. It is nonpainful and easy to use and permits alteration of the flattened nose before surgery and enables correction of the nose at the time of repair of lip. Presurgical NAM includes two concepts which are 'negative sculpturing' and 'passive moulding' of the nose, lips and alveolus. The concept of passive moulding, includes using customised plates made of acrylic to guide the development of the alveolus so as to acquire the result required.

Negative sculpturing is the series of alterations made to the tissue sides of the acrylic plates used for moulding with adding up or removal of acrylic in required regions to get the required alignment of the alveolar and nasal parts.(8) The appliance used for nasoalveolar moulding (NAM) constitutes of an acrylic moulding plate placed intraorally along with nasal stents in order to modify the segments of the alveolus and nasal cartilages simultaneously. This appliance helps to bring together and align the cleft segments which help to reduce the stresses in the segments. This reduction in latent stresses of the cleft segments decreases the number of surgeries required and also improves the esthetics and healing of the surgical site.

#### **Objectives of NAM technique(8):-**

- Decrease the extent of the initial cleft defect which is achieved by active moulding and relocation of the malformed nasal cartilages and alveolar processes.
- Nonsurgical lengthening of the columella.
- Approximation of segments of the lip to reduce tension in the tissues after lip repair and thus reduce scarring.
- Presurgical NAM is suggested to create better bone formation by lessening the dimensions of the cleft and refining nasal esthetics.
- Diminishes the requirement for secondary alveolar bone grafts.

**Impression Technique:-**

The initial impression of the oral cavity, specifically the cleft region is made utilizing a heavy bodied silicone impression material within the first week of birth. Impression trays can be chosen from pre fabricated trays made from the casts of earlier patients, separate trays for the left and right side clefts can be made.(4)

It is advisable to make the impression at a clinic that is equipped to manage airway emergency if at all faced, in the presence of a surgeon.(5) Alginate if used for impression has the disadvantage of breaking away from the tray when the tray is retrieved from the mouth which may remain in deeper sections of the cleft and may even enter the nasal cavity making their removal difficult. Spengler et al. took intraoral and extraoral alginate impression with the patient under general anesthesia. This method is generally not recommended as the patient is subjected to hospitalization for an impression procedure.(2) The tray loaded with impression material is positioned in the oral cavity while the infant is held in an upside down position. This position helps to stop the tongue from falling back and prevent the aspiration of fluids from the oral cavity. The impression tray has to be seated till the anatomy of the upper gum pads are adequately covered by the impression material. After the setting of the impression material, the tray is retrieved, and the oral cavity is inspected for any remnants of impression material. An accurate cast can be obtained by pouring the impression with dental stone.(5)

**Appliance fabrication and design:-**

The plate used for moulding is constructed after blocking the undercuts and the cleft spaces with wax on the dental stone model. Hard, clear self cure acrylic is used for the fabrication of the plate and then trimmed with a denture soft material. A minimum thickness of 23 mm is required to provide structural integrity to the plate and to permit alterations during the procedure of moulding. Adequate relief must be given for the frenum and other attachments. A button for retention is constructed and placed anterior to the plate at an angle of 40°.(9)

The retention arm is placed to prevent any obstruction in approximating the segments of the cleft together and this positioning can be accurately done at the chair side. Only one retention arm is utilized in unilateral cleft. Vertically the location of the retention arm should be at the junction of the upper and lower lip. Orthodontic elastics and tapes are attached to the retention button to fasten the moulding plate in the mouth. A small opening, with a diameter of 68mm is made on the palatal surface of the moulding plate so as to provide an airway if the plate dips down posteriorly. The nasal stent is constructed only after the cleft is decreased to about 56mm in width.(5)

**Appliance adjustments:-**

The patient is seen every week so that the moulding plate can be adjusted to approximate the alveolar segments. Selective removal of the hard acrylic and addition of the soft denture base material to the moulding plate helps in achieving the approximation. Adjustment of the moulding plate should not exceed 1mm in one visit and it should direct the alveolar segments to its final and optimal position. The soft denture material should not build up on the height of the alveolar crest as this will block optimal positioning of the moulding plate.(10)

**Construction of stents for nasal moulding:-**

When the width of the alveolar gap is decreased to approximately 5 mm, the nasal stent can be incorporated. The incorporation of the stent is delayed for the nasal base and the segments of the lips to align better when the space between alveolar segments is decreased. With the approximation of the cleft segments, the alar rim that was extended over a large defect will be relieved which can be raised into a symmetric convex form. 0.36 inch, round stainless steel wire is curved to the shape of a 'Swan Neck' to form the stent.(7) There have been studies conducted that revealed that incorporation of nasal stents produces substantial enhancement of the morphology and aesthetics of the nasal structure presurgically than when the stents are not used.(11)

**Nonsurgical columella lengthening in cases of bilateral cleft lip and palate:-**

Two retention arms along with two nasal stents are required for bilateral cleft cases which are comparable in form to the unilateral stent. Nonsurgical lengthening of the columella can be performed after the addition of the nasal stents in the bilateral cleft. This is done by adding a horizontal band of the denture material joining the both lower lobes of the nasal stent, extending over the columellar base. The nasolabial angle is defined by this band and the tip of the stent elevates and projects the nasal tip in an anterior direction. The tape is stuck to the prolabium beneath the horizontal lip tape and extends down to secure the retention arm with elastics. This vertical pull delivers an opposing action to the ascendant strength applied to the nasal tip of the nasal stent. Taping downwards on the prolabium helps to increase the length of the columella and vertically lengthen the often smaller sized prolabium. The prolabium tape is placed followed by the addition of the horizontal tape.

In Figueroa's technique, alveolar and nasal molding are achieved concurrently using an acrylic plate with rigid acrylic nasal extension. The premaxilla is retracted backward using rubber bands connected to the acrylic plate. A soft resin ball connecting to the acrylic plate across the prolabium is sometimes used to maintain the nasolabial angle. The nasal constituents are made up of 0.028 inch stainless steel wire projecting forward and upward bilaterally from the anterior part of the dental plate in Liou's method. The top portion constitutes a soft resin molding bulb that fits beneath the nasal cartilages for nasal molding. In this method also, nasal and alveolar molding was done simultaneously.

Liao et al. conducted a blinded, retrospective study of 58 patients with complete bilateral CLP, comparing both the techniques. Outcomes were compared by analyzing pre and post treatment facial photographs and clinical charts for efficacy efficiency. The results showed that Grayson and Figueroa NAM similarly improve nasal defects and decrease the gap between the cleft segments; however, the Figueroa technique is associated with less oral mucosal complication and more efficiency.(5) Spengler et al conducted a study in which measurements were made of the cleft size, columellar height and width, alar width before and after NAM. There was found to be significant improvement in the measurements improving the asymmetric nasal complex, maxillary arch and lip.(12)

#### **Initial surgical correction of the alveolus, lip and nose:-**

The primary surgical repair should be performed after the objectives of NAM have been met. Surgical closure of the lip and nose is implemented from 34 months of age. In the case of bilateral cleft patients one or two extra months may be required to achieve the ideal approximation. The extent of the initial cleft deformity determines the time required for moulding therapy. The surgical technique must be altered to utilize the modifications attained through NAM. Once the alveolar segments are aligned the surgeon can implement gingivoperioplasty. A good repair can be attained by remodelling of the stretched alar cartilage and loosening of the nasal mucosa. A suitable modification of the surgical technique will increase the long term conservation of the surgical repair.(5)

#### **Clinical difficulties:-**

As an inconvenient side effect to NAM therapy there can be soreness to the oral mucosal lining, gingiva or nasal mucosal lining. The disproportionate load exerted by the appliance may result in the ulceration of the intraoral tissues. The common locations of ulcerations, pain or redness are the oral vestibule and the labial surface of the premaxilla. The extraoral and intraoral surfaces of the cleft lip and palate of the infant should be carefully observed on each recall check up visit for ulceration, tenderness and appropriate modifications done to the appliance to provide relief to the inflamed areas. The nasal stent can apply too much pressure resulting in ulceration of the intranasal lining. The area under the horizontal prolabium band is also prone to ulceration if the band is too tight.(5)

Skin barrier tapes like Tegaderm TM are suggested to prevent irritation to cheeks due to removal of the cheek tapes. Application of moisturizer or aloe vera gels to the delicate skin of the cheeks and slight relocation of the tapes also prevent continuous irritation to the cheeks.(2)

#### **Conclusion:-**

Presurgical nasoalveolar moulding not only improves the esthetics but also the number of surgical corrections required for the cleft lip and palate deformity.(13) Individuals of the cleft team should provide parents and caregivers not only the technical training but also emotional and moral support and motivation during the NAM treatment. Ideal or desired outcomes may not be attained if parents do not show compliance and motivation to cooperate with the treatment.

**References:-**

1. Patel D, Goyal R, Puri T. Presurgical Nasoalveolar Moulding — An Adjunct to Facilitate Surgical Repair in Infants with Cleft Lip and Palate. *Modern Plastic Surgery*, 2013;3(1):34–42.
2. Retnakumari N, Divya S, Meenakumari S, Ajith PS. Nasoalveolarmolding treatment in presurgical infant orthopedics in cleft lip and cleft palate patients. *Arch Med Health Sci*. 2014;2:36- 47.
3. Murthy PS, Deshmukh S, Bhagyalakshmi A, Srilatha K. Pre surgical nasoalveolarmolding: changing paradigms in early cleft lip and palate rehabilitation. *J Int Oral Health*. 2013;5(2):70-80.
4. Bajaj A, Rao KS, Sharma SM, Shetty V. Modified presurgicalnasoalveolarmolding in the infants with complete unilateral cleft lip and palate: a stepwise approach. *J Maxillofac Oral Surg*. 2011;10(3):275-80.
5. Grayson BH, Shetye PR. Presurgicalnasoalveolar moulding treatment in cleftlip and palate patients. *Indian J Plast Surg*. 2009;42 Suppl:S56-61.
6. Grayson BH, Garfinkle JS. Early cleft management: the case for nasoalveolarmolding. *Am J OrthodDentofacialOrthop*. 2014;145(2):134-42.
7. Grayson BH, Maull D. Nasoalveolarmolding for infants born with clefts of the lip, alveolus, and palate. *ClinPlast Surg*. 2004;31(2):149-58
8. Laxmikanth SM, Karagi T, Shetty A, Shetty S. Nasoalveolar molding : A review. *Journal of Advanced Clinical & Research Insights*.2014; 1: 108–113
9. Liou EJW, Subramanian M, Chen PKT (2007) Progressivechanges of columella length and nasal growth after nasoalveolarmolding in bilateral cleft patients: a 3-year follow-up study.*PlasticReconstrSurg* 119:642–648
10. Mandwe RS, Puri S, Shingane S, Pawar G, Kolhe VR, Alsi A. Presurgicalnasoalveolarremodeling - an experience in the journey of cleft lip and palate.*ClinCosmetInvestig Dent*. 2014 Dec 30;7:1-7.
11. 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):273–88.
12. Spengler AL, Chavarria C, Teichgraeber JF, Gateno J, Xia JJ. Presurgicalnasoalveolarmolding therapy for the treatment of bilateral cleft lip and palate:A preliminary study. *Cleft Palate Craniofac J*. 2006 May;43(3):321-8.
13. *SarinSP, ParkhedkarRD, Deshpande SS, Patil PG, KotheS.Presurgicalnasoalveolarmolding for unilateral midfacial cleft: A case report. Journal of Indian Prosthetic Society. 2010; 10:67-70.*