

NASOALVEOLAR MOLDING: A RISE IN EARLY MANAGEMENT OF NEWBORN PATIENT WITH CLEFT LIP AND PALATE

Reeya K Agrawal¹ | Pallavi Daigavane² | Amit Reche³

Abstract: Orofacial clefts are one of the most frequent congenital oral and maxillofacial abnormalities. When these babies are roughly three months old, lip rebuilding, also known as cheiloplasty, is a critical concern. In several cleft facilities, To improve the treatment success, presurgical Nasoalveolar Molding (NAM) has been included in the therapy protocol. In patients with cleft lip and palate, this technique is routinely used to bring the alveolar segments into normal alignment and improve nasal symmetry. In this article, the benefits of using this method as part of a treatment plan for infants with cleft lip and palate will be described. By gradually shifting the bone segments into a better suitable position, presurgical NAM can assist to lower the prevalence of the initial cleft deformity, reducing the extent of surgical correction essential to unite the lip parts and making nose surgery more straightforward. By use of presurgery 'NAM', surgical reparation of nose and lip is performed first with less effort which reduces formation of scar as well as improves cosmetic outcome. This method also helps to get the desire cosmetic outcome by removing the need of repeated surgical procedures.

Keywords: Natal teeth, cleft lip and palate, Newborn, Bilateral cleft

Corresponding author:

Reeya K Agrawal, E-mail: reeyaagr@gmail.com

Conflicts of interest:

The authors declare no conflicts of interest.

1. Intern, Department of Public Health Dentistry, Sharad Pawar Dental College and Hospital, Datta Meghe Institute of Higher Education and Research), Sawangi (Meghe) Wardha.
E-mail: reeyaagr@gmail.com
2. Associate professor, Department of orthodontics, Sharad Pawar Dental College and Hospital, Datta Meghe Institute of Higher Education and Research, Sawangi (Meghe) Wardha.
E-mail: drpallavi.daigavane15@gmail.com
3. Head Of Department, Department of Public Health Dentistry, Sharad Pawar Dental College and Hospital, Datta Meghe Institute of Higher Education and Research), Sawangi (Meghe) Wardha.
E-mail: dramitreche@gmail.com

MOULAGE NASOALVÉOLAIRE: UNE AUGMENTATION DE LA PRISE EN CHARGE PRÉCOCE DES PATIENTS NOUVEAU-NÉS AVEC FENTE LABIO-PALATINE

Résumé: Les fentes labio-palatine sont l'une des anomalies congénitales buccales et maxillo-faciales les plus fréquentes. Lorsque ces bébés ont environ trois mois, la reconstruction des lèvres, également connue sous le nom de chéiloplastie, est une préoccupation majeure. Dans plusieurs établissements de fente, pour améliorer le succès du traitement, le moulage naso-alvéolaire préchirurgical (NAM) a été inclus dans le protocole de traitement. Chez les patients présentant une fente labio-palatine, cette technique est couramment utilisée pour ramener les segments alvéolaires dans un alignement normal et améliorer la symétrie nasale. Dans cet article, les avantages de l'utilisation de cette méthode dans le cadre d'un plan de traitement pour les nourrissons présentant une fente labio-palatine seront décrits. En déplaçant progressivement les segments osseux dans une position mieux adaptée, le NAM préchirurgical peut contribuer à réduire la prévalence de la déformation initiale de la fente, réduisant ainsi l'étendue de la correction chirurgicale essentielle pour unir les parties des lèvres et rendant la chirurgie nasale plus simple. Grâce à l'utilisation du « NAM » préchirurgical, la réparation chirurgicale du nez et des lèvres est effectuée avec moins d'effort, ce qui réduit la formation de cicatrice et améliore les résultats esthétiques. Cette méthode permet également d'obtenir le résultat esthétique souhaité en éliminant le besoin d'interventions chirurgicales répétées.

Mots Clés : Dents natales, fente labio-palatine, nouveau-né, fente bilatérale

Introduction

The most frequent congenital abnormalities affecting the orofacial area are cleft lip as well as palate.

Cleft lip: The inability of the frontonasal and maxillary processes to fuse, resulting in a cleft in the lip, alveolus, and nasal floor of varied size [1].

Cleft palate: A cleft of the hard and/or soft palate caused by the inability of the palatal shelves of the maxillary process to fuse [2].

Etiology: The following are the etiological causes that cause cleft lip as well as palate

A- Nongenetic: This comprises a variety of teratogenic (environmental) risk factors that might

induce CL/P.

B- Genetic: Genetic causes include the following:

1- Syndromic: In this case, the cleft is linked to another abnormality.

It is usually caused by a solitary gene abnormality (Mendelian or monogenetic)

2- Non-syndromic : In this case, the cleft is usually an autonomous property and it happens in the major part of people with a cleft lip as well as palate (up to 70 percent cases) [3].

Non-genetic factors: Environmental variables, in addition to genetic factors, play a significant influence in the genesis of CL/P [4]. Among the several environmental influences are:

1. Tobacco chewing
2. Alcohol drinking
3. Maternal infections, stress during pregnancy, and chemical exposure are all environmental factors [5].

Clinical Characteristics:-There are two types of clinical signs in these patient and also have some dental issues. Among the several aberrant dental problems are:

1- Natal and neonatal teeth: In clefts, the existence of neonatal teeth appears to have little effect on the main or secondary dentition. Unlike noncleft new-

borns, most of the natal teeth with clefts are situated on lateral border of the premaxillary and maxillary segments [6].

2- Microdontia: CL/P patients commonly have little teeth (microdents). This is more prevalent in situations where the lateral incisors are present. Upper lateral incisors are often peg-shaped [6].

3- Taurodontism: Taurodontism has been linked to a number of different syndromes and dental developmental issues [7].

4- Eruption ectopic: Primary lateral incisors erupt palatally near either inside the cleft side and permanent canines at the alveolar clefts side may palatally erupt adjacent to or within the cleft side. There may be a delay in the eruption of permanent incisors [8].

5- Enamel hypoplasia: Enamel hypoplasia is still more common in CL/P individuals than it is in non-cleft patients, especially in the maxillary central incisors.

6- Deferred tooth maturation: certain growth factors are important for craniofacial development, and when a cleft defect arises, these factors may be overexpressed or underexpressed. This improper expression can affect odontogenesis and induce dental lamina abnormalities [9].

Other problems that may be present

- Difficulty in speech: Muscle phonation is influenced by the malfunctioning of the m. levatorvelopalatini. consonant sound retardation (p, b, t, d, k, g) is the more frequent discovery. Another distinctive trait of most people with cleft lip and palate is abnormal resonance in the nose and trouble articulating [10, 11].
- Infection in the ear: Otitis media is seen in these individuals due to a malfunction of the m. tensor velopalatini muscle, which opens the Eustachian tube [12, 13].

- Feeding issues: As a result of discontinuity in the roof of the mouth, a kid with cleft palate may experience trouble sucking via conventional nipple. The capacity of a newborn to suck is determined by two variables: The capacity of the external lips to conduct the essential sucking actions, or the capacity of the palate to allow for the necessary build-up of pressure in the mouth to drive food into the mouth.

Treatment

This procedure entails surgically creating a non-obtrusive face, vocal apparatus which allows comprehensible speaking, and a dentition that grant ideal function and beauty. The notion of a cleft palate team arose from this requirement. Since the greatest treatment requires a variety of clinical skills, the team may be made up of individuals with varying levels of clinical experience.

Presurgical Nasoalveolar Moulding (PNAM) is a nonsurgical operation that modifies the gums, lips, and nostrils to minimize the severity of the anomaly before surgery.

Objectives of Pnam

- Lip segment apposition to lessen strain in the tissues following lip restoration and hence scarring.
- Lessen the severity of the cleft malformation that created the condition to begin with.
- Give a symmetrical appearance to deformed nasal cartilage.
- Decrease the need for additional alveolar bone grafts.
- Improving intra-oral feeding, maxillary development, nasal tip projection, and reducing nasal deformity.
- The major aims of NAM in individuals with bilateral cleft are to facilitate primary lip, nasal, and alveolar operations, as well as to retract and reposition the premaxilla more posteriorly [14].
- Challenges in terms of psychology, anatomy, and surgery

For families, a youngster with a cleft palate is born can be a terrible experience. Such members of the family may have strong sentiments of dissatisfaction, vulnerability, worry, or sadness. The nose, lips, and maxillary arch are frequently distorted terribly as well as asymmetric in neonates with CLP. Asymmetrical nostrils, drifted septum, and transformed maxillary arch shape are some of the key obstacles in unilateral CLP repair [15]. In the lack of a gold standard procedure for the treatment of nasal deformity, a combination of nasal surgical changes is frequently required to achieve nasal symmetry. The inadequate columella and ectopic premaxilla are the primary problems in bilateral CL repair, extensive scarring at the confluence of the columella and the prolabial fold as well as a lack of nasal projection are typical complications due to the numerous nasal procedures [16].

- **Nasoalveolar Molding Before Surgery**

Presurgical NAM is a non-surgical procedure that reshapes the gums, lips, and nostrils before CLP surgery to minimize the severity of the cleft.; It's also straightforward and painless to put into action. Prior to NAM, reconstructing a big cleft required many procedures starting at birth and lasting till puberty, putting the patient's psycho-social well-being at danger so, after NAM has developed, the orthodontist can shrink the gap as well as realign the alveolar and nasal tissues to their normal anatomic shape [17]. The alveolar processes are actively shaped and repositioned, the premaxilla is retracted and centred, the lip segments are approximated, the columella is lengthened, and the protusion of nasal tip is improved by using nasal stents and tapes or modifying the plate [18].

NAM'S Technique

A newborn's maxilla dental cast is used to create a detachable orthodontic acrylic alveolar molding



Figure 1. Patient having bilateral cleft lip and palate before the presurgical NAM treatment.



Figure 2. Presurgical NAM appliance positioned for detect correction.



Figure 3. Post treatment after cleft closure.

for the NAM device. The initial imprint of the CLP child is made with heavy-bodied silicone within the first week of birth. As a result, the doctor places the newborn in an altered posture and inserts the tray into the mouth. To avoid the tongue from slipping back and to let fluids to escape from the mouth, the baby is kept in this position. The dental stone is placed in the imprint to construct the cast. The mold plate is then made from the resultant cast. The plate is composed of self-curing acrylic that is durable and transparent [19]. A retention button is then made and placed in front of the plate, at a 40-degree angle. Just one retention arm is used in the unilateral cleft. At the chair's side, the position of the retaining arm is predetermined. It is positioned such that the process of pulling the split lips together is not hampered. At the intersection of the top and bottom lips, the retaining arm should be vertically positioned. On the palatal area of the molding plate, a small aperture of 6-8 mm in diameter is constructed to provide for an airway if the plate falls posteriorly. After the cleft of the alveolus has been decreased to a width of about 5-6 mm, the nasal stent is produced [20]. Surgical tape and orthodontic elastic bands are used on one end to attach the device towards cheek extra orally.

Skin barrier tapes are indicated to avoid irritability when coming into contact with the cheeks. The plate is to be kept in the child's mouth at all times and only removed to clean it on a regular basis, according to the instructions.

Weekly visits should be made to the newborn to adjust the molding plate and alveolar segments should be brought together. By gently removing the hard acrylic and placing the soft denture base material on the molding plate, the alterations are completed. During each visit, not more than 1 mm of adjustment of the molding plate is recommended. The alveolar segments should be guided to their final plus best location.

When the alveolar space is decreased to about 5 mm, the nasal stent component of the NAM device is combined. The stent measures 0.36 inch in length and is made of circular stainless steel wire shaped like a “swan neck”. It’s fastened to the labial extension of the molding plate, at the end of the retentive arm. The bilobed kidney-like shape of the stiff acrylic component is achieved. For added comfort, on top of the hard acrylic, a soft denture liner is applied. When the top lobe enters the nose, it gradually pushes the dome forward until tissue blanching appears. The degree of the original cleft malformation determines the length of shaping therapy.

Advantages of NAM

- According to preliminary evidence, regular NAM changes lessen caregiver anxiety and offer them a sense of accomplishment.
- It lowers total cleft care costs by lowering the frequency of future nasal modifications [21].
- NAM takes advantage of cartilage adaptability and flexibility, which is anticipated to last during the initial three months of a baby’s life due to high amounts of oestrogen and hyaluronic acid [22].
- In over 90% of newborns, NAM permits gingivoperiosteoplasty at the first stage of lip restoration and in more than 60% of patients, it eliminates subsequent alveolar bone transplants [23].
- It’s been suggested that NAM decreases lip tension while also allowing for certain nasal adjustment which would be statistically difficult to achieve with simply the operation alone.
- Total advantages of improvised nasal symmetry as well as aesthetics and a reduced number of nasal and dentoalveolar operations results in significant financial savings and also improved patient and family psychological well-being [24].
- Furthermore, no influence on midface development in the sagittal and vertical planes has been seen in individuals who have received this surgery up to the age of 18 years.

Disadvantages of NAM

- The NAM technique’s main flaw is that it ignores nasal cartilage distortion during cartilage plasticity.
- During this time, ignoring significant nasal cartilage distortion frequently leads to multiple surgical revisions [25].
- Furthermore, for individuals with bilateral CLP, Surgical lip adhesion and lip taping may not be the best options.
- If the alveolar segments cannot be managed, the premaxilla can fall vertically or the anterior section of the posterior alveolar segments can collapse palatally.
- Impingement of the premaxilla, collapse of the arch shape, and impaired coordination with the mandibular arch are all possible outcomes [26].
- Impair speech production can be get corrected with the help of nasoalveolar molding.
- Furthermore, a misaligned premaxilla might make fistula closure problematic
- Such disorders make surgical repair, orthodontic care, and speech therapy difficult.
- Surgical lip adhesion has a number of drawbacks, including greater trauma, death ratio, along with increased operational costs for the patient and family [27].

Complications

Oral mucosa, gingival tissues, and nasal passages are all irritated intraoral tissues that can develop ulcerations due to the strong pressure imposed by the appliance, is the most prevalent complication encountered with NAM treatment. Ulcers on the labial side and in the oral vestibule of the premaxilla are prevalent [28]. As a result, it is suggested that the patient’s oral and nasal canals be rigorously inspected for ulcers at each appointment. The intranasal lining of the ala is also susceptible to being irritated by the anterior lobe of the nasal stent when subjected to severe pressure. If the horizontal prolabium band is overly tight, the region beneath it is also at risk of developing ulcers. The cheeks are another source of tissue irritation. Removing the cheek tape should be done with extreme caution to minimise skin irritation, skin barrier tapes are advised. It’s also a good idea to move the tape around a little bit throughout therapy to give the tissues a break if they get inflamed. When replacing tapes, it’s also a good option to apply aloe vera gel to a cheeks to reduce discomfort.

Conclusion

NAM therapy is one of the best treatment modality for children suffering from cleft lip and palate. Dento-alveolar growth and proper correction of nasal shape can be corrected with the help of nasoalveolar moulding. One can get successful and best results from this therapy.

References

1. Grayson BH, Shetye PR. Presurgical nasoalveolar moulding treatment in cleft lip and palate patients. *Indian Journal of Plastic Surgery*. 2009 Oct;42(S 01):S56-61.
2. Vyas T, Gupta P, Kumar S, Gupta R, Gupta T, Singh HP. Cleft of lip and palate: A review. *Journal of family medicine and primary care*. 20
3. Lakhanpal M, Gupta N, Rao NC, Vashisth S. Genetics of Cleft Lip and Palate—Is it still patchy?. *JSM*. 2014;2(3):1030.
4. Kohli SS, Kohli VS. A comprehensive review of the genetic basis of cleft lip and palate. *Journal of oral and maxillofacial pathology: JOMFP*. 2012 Jan;16(1):64.
5. Vyas T, Gupta P, Kumar S, Gupta R, Gupta T, Singh HP. Cleft of lip and palate: A review. *Journal of family medicine and primary care*. 2020 Jun;9(6):2621.
6. Tan EL, Yow M, Kuek MC, Wong HC. Dental maturation of unilateral cleft lip and palate. *Annals of maxillofacial surgery*. 2012 Jul;2(2):158.
7. Mitchell JC, Wood RJ. Management of cleft lip and palate in primary care. *Journal of pediatric health care*. 2000 Jan 1;14(1):13-9.
8. Timmons MJ, Wyatt RA, Murphy T. Speech after repair of isolated cleft palate and cleft lip and palate. *British journal of plastic surgery*. 2001 Jul 1;54(5):377-84.
9. McDonald RE, Avery DR. *Dentistry for the child and adolescent*. (No Title). 1974.
10. Sharma RK, Nanda V. Problems of middle ear and hearing in cleft children. *Indian Journal of Plastic Surgery*. 2009 Oct;42(S 01):S144-8.
11. Shetye PR, Grayson BH. NasoAlveolar molding treatment protocol in patients with cleft lip and palate. In *Seminars in Orthodontics* 2017 Sep 1 (Vol. 23, No. 3, pp. 261-267). WB Saunders.
12. Grayson BH, Cutting CB. Presurgical nasoalveolar orthopedic molding in primary correction of the nose, lip, and alveolus of infants born with unilateral and bilateral clefts. *The Cleft palate-craniofacial journal*. 2001 May;38(3):193-8.
13. Lakhanpal M, Gupta N, Rao NC, Vashisth S. Genetics of Cleft Lip and Palate—Is it still patchy?. *JSM*. 2014;2(3):1030.
14. Kadam M, Kadam D, Bhandary S, Hukkeri RY. Natal and neonatal teeth among cleft lip and palate infants. *National journal of maxillofacial surgery*. 2013 Jan;4(1):73.
15. Jamal GA, Hazza'a AM, Rawashdeh MA. Prevalence of dental anomalies in a population of cleft lip and palate patients. *The Cleft palate-craniofacial journal*. 2010 Jul;47(4):413-20.
16. Bakker A, Maertens KJ, Van Son MJ, Van Loey NE. Psychological consequences of pediatric burns from a child and family perspective: a review of the empirical literature. *Clinical psychology review*. 2013 Apr 1;33(3):361-71.
17. Murthy PS, Deshmukh S, Bhagyalakshmi A, Srilatha KT. Pre surgical nasoalveolar molding: changing paradigms in early cleft lip and palate rehabilitation. *Journal of international oral health: JIOH*. 2013 Apr;5(2):70.
18. Grayson BH. Discussion: limited evidence for the effect of presurgical nasoalveolar molding in unilateral cleft on nasal symmetry: a call for unified research. *Plastic and reconstructive surgery*. 2013 Jan 1;131(1):75e-6e.
19. Kumar A, Mogre S. Presurgical Nasoalveolar Molding in a Neonate with Unilateral Cleft Lip and Palate. *Journal of Oral Health & Community Dentistry*. 2018 May 1;12(2).
20. Koya S, Shetty S, Husain A, Khader M. Presurgical nasoalveolar molding therapy using Figueroa's NAM technique in unilateral cleft lip and palate patients: a preliminary study. *Journal of Clinical Pediatric Dentistry*. 2016 Jun 1;40(5):410-6.
21. Abbott MM, Meara JG. Nasoalveolar molding in cleft care: is it efficacious?. *Plastic and reconstructive surgery*. 2012 Sep 1;130(3):659-66.
22. Matsuo K, Hirose T. Nonsurgical correction of cleft lip nasal deformity in the early neonate. *Annals of the Academy of Medicine, Singapore*. 1988 Jul 1;17(3):358-65.
23. Chao Y, Ning H, Bing S. Clinical research of presurgical orthodontic treatment of complete cleft lip and palate infant. *West China Journal of Stomatology*. 2011 Aug 1;29(4).
24. Pfeifer TM, Grayson BH, Cutting CB. Nasoalveolar molding and gingivoperiosteoplasty versus alveolar bone graft: an outcome analysis of costs in the treatment of unilateral cleft alveolus. *The Cleft palate-craniofacial journal*. 2002 Jan;39(1):26-9.
25. Grayson BH, Garfinkle JS. Early cleft management: the case for nasoalveolar molding. *American Journal of Orthodontics and Dentofacial Orthopedics*. 2014 Feb 1;145(2):142.

26. Fedeles Jr J, Ziak P, Fedeles J. Nasoalveolar molding in complete cleft lip nasal deformity patients. Bratislavske lekarske listy. 2012 Jan 1;113(5):293-7.
 27. Clark SL, Teichgraeber JF, Fleshman RG, Shaw JD, Chavarria C, Kau CH, Gateno J, Xia JJ. Long-term treatment outcome of presurgical nasoalveolar molding in patients with unilateral cleft lip and palate. The Journal of craniofacial surgery. 2011 Jan;22(1):333.
 28. Grayson BH, Shetye PR. Presurgical nasoalveolar moulding treatment in cleft lip and palate patients. Indian Journal of Plastic Surgery. 2009 Oct;42(S 01):S56-61.
-