

Nasoalveolar Molding: Part 1- A General Overview

Elham sadat Emadian Razavi

Postgraduate student, Orthodontics Department, Dental School, Tehran University of Medical Sciences. Tehran. Iran.

Correspondence to:

Dr. Elham sadat Emadian Razavi, Postgraduate student, Orthodontics Department, Dental School, Tehran University of Medical Sciences, Tehran, Iran

ABSTRACT

Presurgical Nasoalveolar Molding (NAM) was introduced to reshape the alveolar and nasal segments prior to surgical repair and improve the surgical outcome of the primary repair in cleft lip and palate patients. This review of literature attempts to represent a general overview and values of this technique.

KEYWORDS: Cleft lip and palate, Nasoalveolar molding

INTRODUCTION

Based on embryological view, origin of some of craniofacial structure are as follows:

Lip: Development of lips occurs from the 4th to 7th weeks of gestation.^{1,2}

Frontonasal prominence: it forms from mesenchymal tissue ventral to the forebrain and took part the development of the medial and lateral nasal prominences.³

Maxillary and mandibular prominence: the paired maxillary and mandibular prominences are formed from neural crest cells migrating from the first pharyngeal arch.⁴

Primary palate: the primary palate or the premaxilla forms from the fusion of the medial palatine processes.

Secondary palate: the secondary palate develops in the 6th to 12th weeks of gestation.

Embryology of the normal palate is illustrated in Fig. 1.

Orofacial clefts, occurs because of failure the fusion of different processes. Failure of complete fusion of advancing maxillary prominence and medial nasal prominences on one side lead to unilateral cleft lip. If medial palatine processes fail to fuse also, the cleft lip will extend to incisive foramen through the maxillary dentoalveolar process. When there is an incomplete fusion of lateral palatine processes with the medial palatine process and/or the nasal septum, a cleft palate will be seen.⁵

Features of unilateral cleft lip are nasal deformity, rotation of lateral nasal cartilage and depression toward cleft side, short and deviated columella. In the palatal region, the deviation of nasal septum shifts the base of the nose to unaffected side.^{6,7}

Treatment Options: The philosophy of treatment is restoring physiology and anatomy of the lip, nasal and alveolar components.⁸ An early evidence from the 16th century shows attempts for retraction of protrusive premaxilla in bilateral cleft lip and palate (BCLP)

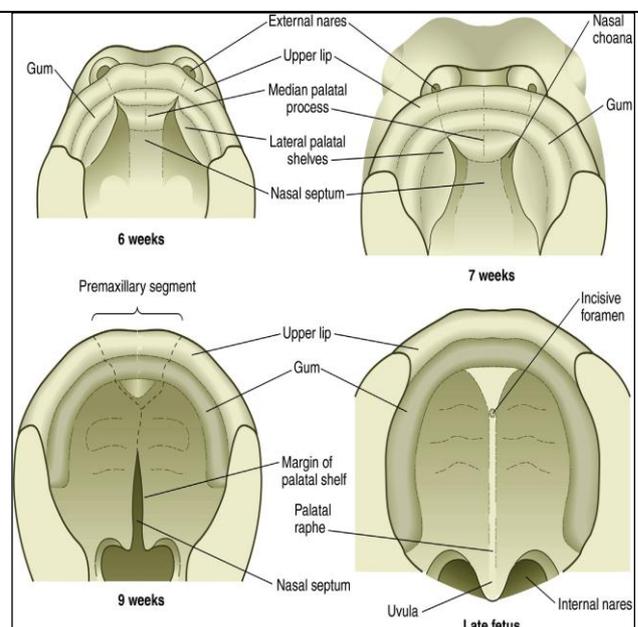


Figure 1. Embryology of the normal palate. Palate formation occurs from gestational weeks 6 to 10 and involves 4 primary structures: the median palatine process, a pair of lateral palatine processes (palatal shelves), and the nasal septum. The median palatine process forms the primary palate, which is often referred to as the premaxillary component of the maxilla. This structure ultimately houses the 4 maxillary incisors. The secondary palate is formed by the lateral palatine processes, which begin to fuse during the seventh week. The nasal septum then joins the fused palatal shelves to complete the formation of the secondary palate. (Reprinted from Carlson BM. Head and neck. In: Carlson BM, editor. Human Embryology and Developmental Biology, Fifth Edition. Philadelphia: Elsevier Saunders, 2014)

patients in order to reduce the severity of the deformity before primary surgical repair.⁹ Pre-surgical molding techniques aim to align and prepare skeletal and soft tissues for definitive surgical repair. Some methods to do that in current practice include lip adhesion^{10,11}, triangular repair¹², rotation-advancement; Millard technique and modifications¹³, anatomic subunit repair¹⁴, maxillary plates¹⁵, the Latham device¹⁶, lip taping¹⁷, and nasoalveolar molding (NAM).¹⁸

How to cite this article:

Razavi ESE. Nasoalveolar Molding: Part 1- A General Overview. Int J Dent Med Res 2015;1(6):157-159.

Pre-surgical Nasoalveolar Molding: The NAM appliance consists of two parts: removable alveolar molding plate that is made of orthodontic acrylic and nasal stent made of 0.032-inch stainless steel wire that is embedded into the anterior portion of acrylic molding plate (Fig. 2-5). The appliance is adjusted weekly or biweekly to correct the nasal and alveolar deformity gradually.

NAM can be used for a wide range of cleft deformities, including complete clefts without an intact nasal floor.¹⁹

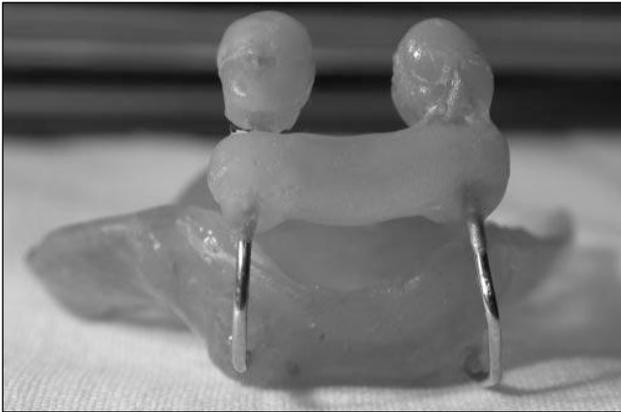


Figure 2. NAM appliance for BCLP patient (Reprinted from Adam L. Spengler et al, Cleft Palate–Craniofacial Journal: May 2006, Vol. 43



Figure 3. A patient with NAM appliance in place (Reprinted from Adam L. Spengler et al, Cleft Palate–Craniofacial Journal: May 2006, Vol. 43 No. 3).



Figure 4. NAM appliance for BCLP patient (Reprinted from Catherine T. H. et al, Plast. Reconstr. Surg. 122: 1131, 2008)

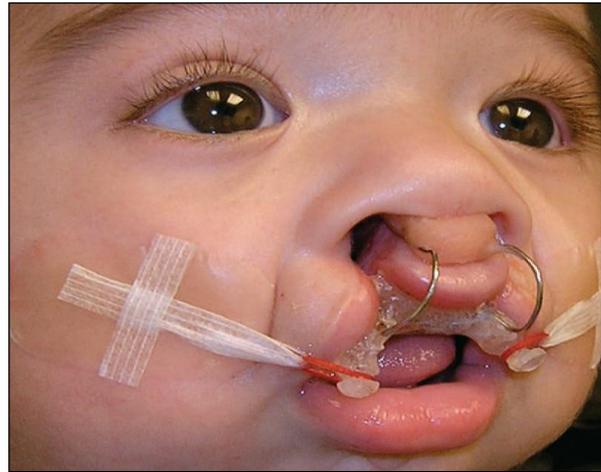


Figure 5. A patient with NAM appliance in place (Reprinted from Catherine T. H. et al, Plast. Reconstr. Surg. 122: 1131, 2008)

The objectives of pre-surgical NAM are:

- Active molding, providing symmetry and repositioning of nasal and alveolar processes;
- Non-surgical lengthening of the columella;
- Facilitating lip repair without scarring by placing the lip segments in a more anatomically position and reducing the distance between cleft lip segments;
- Improving nasal correction and providing projection for a flat nasal tip;
- Reducing the number of surgical procedures;
- Reducing the need for secondary alveolar bone graft;
- Serving as an obturator to help infant in suckling.¹⁹⁻²¹

ADVANTAGES

In a study performed by Barillas et al., NAM treated infants showed more symmetric nasal cartilages after 9 years follow-up than the group who were undergone surgery alone.²²

Garfinkle et al., observed two groups: BCLP patients and non-cleft samples up to 12 years. The BCLP group was treated with NAM and primary lip and nose surgery. The anthropometry nasal measurements were near to normal non-cleft group.²³

Dec W. et al., examined the incidence of postoperative oronasal fistulae after preoperative NAM with a retrospective study design with the sample size of 178 patients. Four palatal fistulas occurred, three were healed spontaneously, and one required surgical repair. They concluded that although palatal fistulae may be related to surgeon experience and type of pre-surgical techniques, NAM with nasal floor closure has a low incidence of oronasal fistulae.²⁴

COMPLICATIONS

Levy-Bercowski D. et al., categorized complications of pre-surgical NAM in the following format:

1. Soft tissue complications including mucosal ulceration, intraoral bleeding, tissue fungal infections, tissue irritation, mega nostril, impingement of nasal epithelium, and nasal bleeding; Tissue irritation was the most and nasal bleeding was the least common complication.
2. Hard tissue complications like asymmetric T-shaped arch
3. Compliance issues consist of broken appointments, removal of the appliance by tongue or hands; The most prevalence was broken appointments once or more, and the least was the removal of the appliance by hands. Compliance issues were of greater concern, so compliance of the patient, parents or caregivers is a key factor for successful outcomes. Hard and soft tissue complications can be managed by the clinician without the need for suspending the treatment.²⁵

REFERENCES

1. Mossey PA, Little J, Munger RG, Dixon MJ, Shaw WC. Cleft lip and palate. *The Lancet*. 2009;374(9703):1773-85.
2. Diewert VM. Development of human craniofacial morphology during the late embryonic and early fetal periods. *American journal of orthodontics*. 1985;88(1):64-76.
3. Kirschner RE, LaRossa D. Cleft lip and palate. *Otolaryngologic Clinics of North America*. 2000;33(6):1191-215.
4. Tapadia MD, Cordero DR, Helms JA. It's all in your head: new insights into craniofacial development and deformation. *Journal of anatomy*. 2005;207(5):461-77.
5. Vyas RM, Warren SM. Unilateral Cleft Lip Repair. *Clinics in plastic surgery*. 2014;41(2):165-77.
6. Dibbell DG. Cleft lip nasal reconstruction: correcting the classic unilateral defect. *Plastic and reconstructive surgery*. 1982;69(2):264-70.
7. McComb H. Primary correction of unilateral cleft lip nasal deformity: a 10-year review. *Plastic and reconstructive surgery*. 1985;75(6):791-7.
8. Keçik D, Enacar A. Effects of nasoalveolar molding therapy on nasal and alveolar morphology in unilateral cleft lip and palate. *Journal of Craniofacial Surgery*. 2009;20(6):2075-80.
9. Hofmann J. *De labiis leporinis: von Hasenscharten*. Bergmann, Heidelberg.
10. Gatti GL, Lazzeri D, Romeo G, Balmelli B, Massei A. Effect of lip adhesion on maxillary arch alignment and reduction of a cleft's width before definitive cheilognathoplasty in unilateral and bilateral complete cleft lip. *Journal of Plastic Surgery and Hand Surgery*. 2010;44(2):88-95.
11. Rintala A, Haataja J. The effect of the lip adhesion procedure on the alveolar arch. *Scandinavian Journal of Plastic and Reconstructive Surgery and Hand Surgery*. 1979;13(2):301-4.
12. TENNISON CW. The repair of the unilateral cleft lip by the stencil method. *Plastic and reconstructive surgery*. 1952;9(2):115-20.
13. Millard Jr DR. A radical rotation in single harelip. *The American Journal of Surgery*. 1958;95(2):318-22.
14. Fisher DM. Unilateral cleft lip repair: an anatomical subunit approximation technique. *Plastic and reconstructive surgery*. 2005;116(1):61-71.
15. McNeil CK. Congenital oral deformities. *Br Dent J*. 1956;101(1):191-19d.
16. Latham R, Kusy R, Georgiade N. An extraorally activated expansion appliance for cleft palate infants. *The Cleft palate journal*. 1976;13:253-61.
17. Pool R, Farnworth TK. Preoperative lip taping in the cleft lip. *Annals of plastic surgery*. 1994;32(3):234-49.
18. Grayson BH, Wood R. Preoperative columella lengthening in bilateral cleft lip and palate. *Plastic and reconstructive surgery*. 1993;92(7):1422-3.
19. Grayson BH, Garfinkle JS. Early cleft management: The case for nasoalveolar molding. *American journal of orthodontics and dentofacial orthopedics: official publication of the American Association of Orthodontists, its constituent societies, and the American Board of Orthodontics*. 2014;145(2):134.
20. Murthy PS, Deshmukh S, Bhagyalakshmi A, Srilatha K. Pre Surgical Nasoalveolar Molding: Changing Paradigms in Early Cleft Lip and Palate Rehabilitation. *Journal of International Oral Health: JIOH*. 2013;5(2):70.
21. Moetamedi AK, Feizbakhsh M, Mortazavi M, Derakhshanfar H, Hasheminasab M. Nasoalveolar molding in cleft lip and palate, a review of literature. *Journal of Craniomaxillofacial Research*. 2014;1(2):32-6.
22. Barillas I, Dec W, Warren SM, Grayson BH. Nasoalveolar molding improves long-term nasal symmetry in complete unilateral cleft lip–cleft palate patients. *Plastic and reconstructive surgery*. 2009;123(3):1002-6.
23. Garfinkle JS, King TW, Grayson BH, Brecht LE. A 12-year anthropometric evaluation of the nose in bilateral cleft lip–cleft palate patients following nasoalveolar molding and Cutting bilateral cleft lip and nose reconstruction. *Plastic and reconstructive surgery*. 2011;127(4):1659-67.
24. Dec W, Shetye PR, Grayson BH, Brecht LE, Warren SM. Incidence of Oronasal Fistula Formation After Nasoalveolar Molding and Primary Cleft Repair. *Journal of Craniofacial Surgery*. 2013;24(1):57-61.
25. Levy-Bercowski D, Abreu A, DeLeon E, Looney S, Stockstill J, Weiler M, et al. Complications and solutions in presurgical nasoalveolar molding therapy. *The Cleft Palate-Craniofacial Journal*. 2009;46(5):521-8.

Source of Support: Nil
Conflict of Interest: Nil