Presurgical nasoalveolar molding in unilateral cleft lip and palate

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Abstract

Unilateral cleft lip and palate (UCLP) patients have an esthetic and functional compromise of the middle third of the face and nasal structures. To improve the esthetic result of lip repair, the concept of presurgical nasoalveolar molding (PNAM) was brought into conception. PNAM is an easy and passive method of bringing the alveolus and lips together by redirecting the forces of natural growth. This case report documents a 2-year follow-up of PNAM in UCLP.

Keywords: Cleft lip, cleft palate, nasoalveolar molding

Introduction

Cleft lip and palate is a congenital anomaly produced by embryological defects during formation of the face. The worldwide prevalence of cleft lip and palate is 1:600.[1] A child is born with a cleft somewhere in the world every 2 min according to a World Health Organization study published in 2001.[2] In India, the number of infants born every year with the cleft lip and palate is 28,600, which means 78 affected infants are born every day, or 3 infants born with clefts every hour.[1]

Unilateral cleft lip and palate (UCLP) patients have an esthetic and functional compromise of the middle third of the face and nasal structures. The alar cartilage on the cleft side, which is flattened or concave and splayed out by the alveolar gap, results in depression, and displacement of the nasal tip towards the side of the cleft. Furthermore, the nasal septum and the columella are inclined with the base deviated to the noncleft side.

The standard treatment for the cleft lip palate patients remains a subject of great debate. There are two main approaches, one involving surgical repair alone and the other involving presurgical molding followed by surgical repair.[3] Surgical treatment of cleft lip and palate is documented since AD 317. There have been a variety of eminent surgeons and researchers who customized and adapted novel techniques in cleft repair, which yielded superior results. To further improve the esthetic result of lip repair, the idea of presurgical nasoalveolar molding (PNAM) was brought into conception.

Case Report

A 2-month-old male child reported to the Department of Pedodontics and Preventive Dentistry with an UCLP of the left side [Figure 1]. His medical and family histories were noncontributory. On clinical examination, complete cleft lip and cleft palate of the left side was observed and a diagnosis of Veau's Class III was made. PNAM followed by primary surgical repair was planned and executed.

After obtaining an informed consent from the parents, detailing the risks and benefits of PNAM, the case was scheduled for an impression. A pretrimmed custom made tray without any sharp edges was made after obtaining an approximate size of the maxillary arch, based on clinical judgment. The impression was then made in Putty (Reprosil, Dentsply) with the baby in the most upright position, being held by one of the parents, thereby exercising caution to avoid any airway obstruction [Figure 2]. A cast was then poured in dental stone and appropriately trimmed. All the measurements were made with calipers and ruler, and finally recorded and documented for further reference.
After blocking all the undercuts and applying separating media/Vaseline to the prepared cast, cold cure acrylic resin was used with Sprinkle-on technique to fabricate the molding appliance [Figure 3]. After insertion, once the appliance was stable, 3M Tegaderm was adapted on both sides of the cheeks. Micropore tape (3M) was then used along with red elastics, which were stretched as far as possible to make sure adequate pressure was applied to bring about orthopedic movement. Regular replacement by new elastics ensured the effectiveness of the appliance by maintaining the tension. The appliance was left in situ for 24 h, removing it only for cleaning purposes.

The patient was recalled for regular weekly follow-up visits. On every weekly visit, a new impression was taken by the same method as described above and a cast poured with dental stone. The alveolar cleft was regularly measured with calipers to examine cleft closure followed by making necessary adjustments to the appliance. These were made by removing hard acrylic in the area of growth (labial flange and palate adjacent to cleft) and replacing it with soft relining material to provide pressure for resorption, thereby closing the cleft gap.

A nasal stent is commonly fabricated after achieving a closure of approximately 5 mm, but in our case as the patient was already 2 months old, we did not waste any time. We fabricated and activated it along with the PNAM appliance on the 1st day of insertion itself. The nasal stent is an orthodontic wire which was attached to the vestibular ridge of the appliance. The tip with protective acrylic was inserted towards the medial wall of the defective nostril. The nasal stent was adjusted with an orthodontic plier on a weekly basis to direct correct alar cartilage growth.

Primary surgical repair of the cleft lip with Millard’s rotation advancement flap technique was performed when alveolar gap of <2 mm was achieved [Figure 4].

Discussion

McNeil first introduced the concept of modern surgical orthopedics in 1950. It was Matsuo and Hirose[6] and Grayson et al.[5] who described the first PNAM appliance. The theoretical basis of PNAM treatment is attributed to Matsuo’s research[6] which states that the nasal cartilage, that is still
developing can be subject to repositioning within the first 6 weeks postpartum.

There have been a number of reports on effectiveness of PNAM in patients with ULCP (Grayson et al. 1999, Grayson and Cutting 2001, Yang et al. 2003 etc.).

In ULCP, the use of the presurgical appliance helps provide a more coalescent cleft and an ideally shaped alveolar arch form.[7] This in turn diminishes tension during the primary surgery, thereby reducing scar formation. This alignment of the alveolar segments lays the foundation for good lip symmetry that produces more favorable bone formation by reducing the cleft gap. In addition, retrospective studies by Santiago et al. shows that a significant decrease in alveolar cleft size results in a diminished need for bone grafting during the mixed dentition stage.[8]

In addition to the lip and alveolus, most cleft surgeons today recommend correction of cleft lip nasal deformity at the time of primary lip repair. Grayson and Cutting[9] were one of the first to combine the concepts of presurgical orthopedics and preoperative treatment of the cleft lip nasal deformity. They developed the concept of nasoalveolar molding, which combined a nasal molding stent with a passive, presurgical molding appliance in treating cleft lip and palate patients. This later allows the surgeon to definitively correct the nose without any extensive dissection.

Follow-up

Two-year recall revealed an acceptable esthetic result as assessed by clinical examination and intraoral photographs [Figure 5].

**Conclusion**

PNAM is an easy and passive method of bringing the alveolus and lips together by redirecting the forces of natural growth. It also allows for correction of the flattened nose prior to surgery and also facilitates nose repair at the primary lip repair stage.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**

There are no conflicts of interest.

**References**

1. Mossey P, Little J. Addressing the challenges of cleft lip and palate research in India. Indian J Plast Surg 2009;42:S9-S18.
2. Global Strategies to Reduce the Health Care Burden of Craniofacial Anomalies. Report of WHO Meetings on International Collaborative Research on Craniofacial Anomalies. Geneva, Switzerland: 2000.
3. Ezzat CF, Chavarria C, Teichgraeber JF, Chen JW, Stratmann RG, Gateno J, et al. Presurgical nasoalveolar molding therapy for the treatment of unilateral cleft lip and palate: A preliminary study. Cleft Palate Craniofac J 2007;44:8-12.
4. Matsuo K, Hirose T. Preoperative non-surgical over-correction of cleft lip nasal deformity. Br J Plast Surg 1991;44:5-11.
5. Grayson BH, Santiago PE, Brecht LE, Cutting CB. Presurgical nasoalveolar molding in infants with cleft lip and palate. Cleft Palate Craniofac J 1999;36:486-98.
6. Matsuo K, Hirose T, Tomono T, Iwasawa M, Katohda S, Takahashi N, et al. Nonsurgical correction of congenital auricular deformities in the early neonate: A preliminary report. Plast Reconstr Surg 1984;73:38-51.
7. Yang S, Stelnicki EJ, Lee MN. Use of nasoalveolar molding appliance to direct growth in newborn patient with complete unilateral cleft lip and palate. Pediatr Dent 2003;25:253-6.
8. Santiago PE, Grayson BH, Cutting CB, Gianoutsos MP, Brecht LE, Kwon SM. Reduced need for alveolar bone grafting by presurgical orthopedics and primary gingivoperiosteoplasty. Cleft Palate Craniofac J 1998;35:77-80.
9. 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. Cleft Palate Craniofac J 2001;38:189-8.

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**Figure 5:** (a) Preoperative before presurgical nasoalveolar molding, (b) After presurgical nasoalveolar molding and before surgery, (c) 2 years follow-up after surgery