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Management Of Bilateral Cleft Lip And Palate In A New-Born By Presurgical Nasoalveolar Molding

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ABSTRACT

Management of cleft lip and palate involves a multidisciplinary approach including a team of doctors. The dental surgeons play a vital role in ensuring an outcome which is both esthetic and functionally advantageous to the patient. Presurgical infant orthopaedics was introduced in the 1950s as an adjunct to surgical procedures. Many modifications have been proposed to this concept. Presurgical Nasoalveolar molding technique manipulates the immature nature of the nasal cartilages and the alveolar bone to bring about changes in the morphology of the cleft lip and palate prior to surgery. This technique molds the nasal cartilages and the dentoalveolar arches and has many benefits. It decreases the need for secondary surgeries and the amount of scar tissue present is also negligible. In this article, we present a case of bilateral cleft palate with cleft lip in a new born baby, managed with Presurgical Nasoalveolar Molding before surgical correction.

Keywords: *cleft lip, cleft palate, presurgical infant orthopaedics, presurgical nasoalveolar molding, cleft surgery, PNAM, lip correction surgery*

1. INTRODUCTION

Cleft lip and palate is one of the most common congenital defects in the world. Statistics by the Centers for Disease Control and Prevention show that one in every 1600 babies in the US are born with cleft lip and palate. It not only affects the facial appearance but also speech and hearing and negatively impacts the psychology of the person.

Management of cleft lip and palate requires a multidisciplinary approach with a team of doctors. These doctors comprise of the following departments - audiology, radiology, genetic counseling, neurology and neurosurgery, nursing, ophthalmology, plastic and reconstructive surgery, oral and maxillofacial surgery, orthodontics, otolaryngology, pediatric medicine, pediatric dentistry, psychology, social work, and speech-language pathology.[1]

The Presurgical Nasoalveolar Molding (PNAM) technique is a presurgical technique that makes use of the malleability of the new born nasal cartilage and palate to mould and bring about approximation of the palatal segments, premaxilla before surgery.[2] Wires and acrylic nasal stents are fabricated and attached to an intraoral device. With continuous usage and adjustments made to the PNAM appliance, the cleft in the infant significantly reduces. Finally, the extent of surgical correction required to close the defect also significantly decreases.[3]

In this case report, we wish to showcase the management of a new-born baby with bilateral cleft palate with cleft lip using PNAM technique.

2. CASE REPORT

A new born baby, aged one day old was brought to the Department of Prosthodontics. The baby's parents were worried about poor feeding, unpleasant facial appearance and the risk of aspiration of milk. Immediately after birth, the baby had been examined by a pediatrician. Apart from having cleft palate and lip, the baby was certified to be systematically healthy with no other associated findings. On examination, the baby was diagnosed as having bilateral cleft lip and palate, extending up to ala of the nose on left side (Figure 1). The premaxilla was present outside the limits of the oral cavity. The baby was diagnosed with Bilateral Cleft of Palate (Veau IV). The parents were informed of the condition and procedure and a written

consent was obtained from them.

Figure 1: At birth, Bilateral Cleft palate (Veau IV) with Cleft lip, Cleft size = 12mm

The treatment plan was formulated for the baby. As the immediate concern for the baby was feeding, a feeding plate was fabricated first. This involved making a diagnostic impression of the palatal segments, followed by pouring of a cast with Type III dental stone. The cast was inspected for the severe undercuts and blocked out with Type II dental stone (Figure 2a).

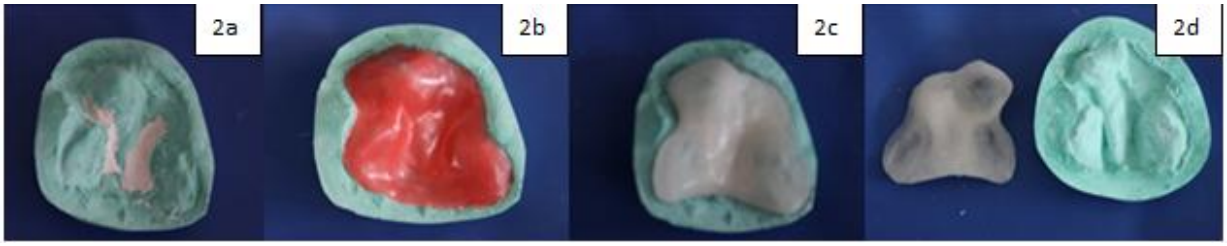

Figure 2: Processing of the NAM plate by block out, wax adaptation followed by acrylization

Two plates were fabricated with autopolymerising clear acrylic. One was delivered to the patient as a feeding plate. Two holes were drilled in the palatal portion of the feeding plate for insertion of dental floss. This was done to prevent accidental swallowing or lodging of the tray in the baby's throat. The second plate which was fabricated was used as a special tray to make the final impression for the PNAM appliance.

The next stage of the treatment procedure was to start Presurgical nasoalveolar molding (PNAM).

The objectives of PNAM include-

- Repositioning of the deformed nasal cartilages and alveolar processes through active molding
- Columellar lengthening and nasal correction by molding the alar cartilages to an esthetically favorable position.
- Approximation of the lip segments to an anatomically favorable position to facilitate lip repair surgery with minimal scarring.
- To reduce the size of the cleft, as it has been suggested that the bone healing is inversely proportional to the cleft size.[4] A larger cleft shows slower bone healing whereas favorable bone formation can be achieved by reducing the size of the cleft.[4] This reduces the need for secondary alveolar bone grafts.

3. TECHNIQUE OF PRESURGICAL NASOALVEOLAR MOLDING

Primary impression was made with the special tray loaded with putty addition silicone (Aquasil, Dentsply Sirona, NC, USA). The baby was made to sit upright on his mother's lap and the face was titled towards the floor. This position was adopted to avoid any airway obstruction. His head was held by the clinician's finger while the impression material set. Constant crying by the baby guaranteed adequate breathing and obstruction free airway. Adequate suctioning and emergency equipment were available chairside. Once the impression was removed, the oral and nasal cavities were inspected thoroughly for any residual material. The working cast was poured with Type III stone (DPI, Mumbai, India).

The undercuts in the cast were blocked out using Type II dental stone (DPI, Mumbai, India). Modelling wax (Pyrax Polymers, India) of 2mm thickness was adapted over the alveolar segments, cleft, and extra orally over the premaxilla (Figure 2b). Processing was done using heat polymerized polymethylmethacrylate (Acralyn H, Asian Acrylates, India) (Figure 2c). After processing, the PNAM appliance was trimmed and polished (Figure 2d). The extension into the nasal chamber was trimmed off in order to maintain patency if airway. Two buttons were fabricated on the palatal surface of the appliance. The buttons

were positioned in such a way that they projected out at an angle of 45 degrees extra orally (Figure 3).

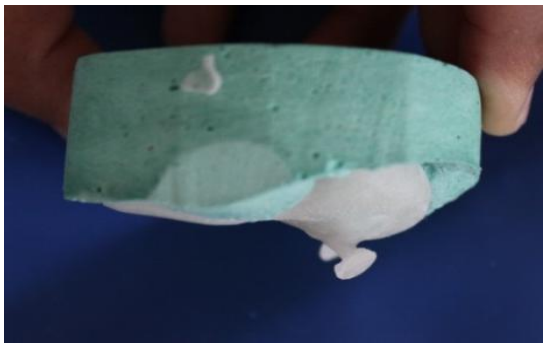

Figure 3: Buttons fixed at 45 degree angulation

In the PNAM appliance insertion appointment, the plate was inserted into the baby's mouth. Posterior extension was verified, and the baby was able to cry and feed normally. Once the fit of the plate was deemed satisfactory, it was held in position with the help of Steri strips (3M, USA). Orthodontic elastics were attached to the buttons, which in turn held the Steri strips in place. The elastic was stretched and the Steri strips were taped to the cheeks at an angle of 45 degrees (Figure 4). Parents were instructed how to use and clean the device and were ordered to maintain the prosthesis on the infant all day long except for cleaning.

Figure 4: PNAM appliance taped with elastics and Steri strips

The patient was recalled twice a week. At each appointment, soft relining material (Soft-Liner, GC Corp, Tokyo, Japan) was applied in the areas on the appliance and molded by mimicking oral movements like suckling (Figure 5). Also, the appliance was trimmed on the intaglio surface to facilitate movement of the alveolar segments into proximity with each other.

Figure 5: Relining done by mimicking oral functions

The rationale behind trimming and relining the appliance:

The goal of PNAM in bilateral cleft lip and palate is to move the premaxilla to an acceptable position inside the oral cavity. In most cases of bilateral cleft palate, the premaxilla is outside the confines of the oral cavity. There is inadequate space between the anterior palatal shelves to retract the premaxilla. Hence, space is achieved by directing the posterior lateral segments outwards, while simultaneously derotating and retracting the premaxilla towards the midline.[5]

This is achieved by serial adjustments (Figure 6). Hard acrylic is removed from the areas the segments are being directed towards and adding soft relining material in the areas where force must be applied to accomplish the movement.[5] Using this concept, trimming was done on the lateral borders of the alveolar segments and a soft liner was added on the medial side near the cleft. In the premaxilla, the soft liner was added anterior to the premaxilla, and acrylic is removed from the region behind it.[5]

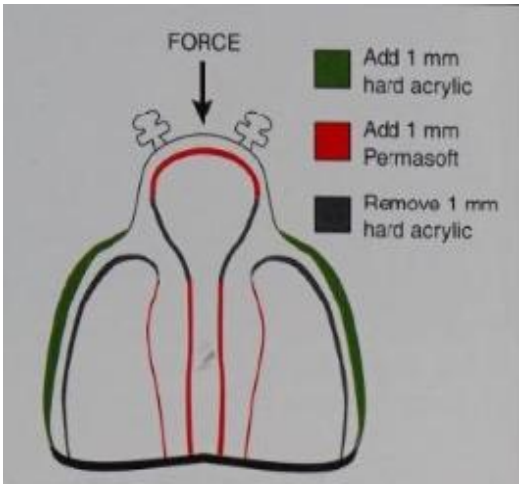

Figure 6: Areas to remove hard acrylic and areas to add soft liner
Courtesy: Taylor T. Clinical Maxillofacial Prosthetics; 2000 Quintessence Publishing Co, Inc

A new PNAM appliance was fabricated every month to accommodate the change in cleft size and position of the alveolar segments. After a period of three months, the premaxilla assumed a reasonable position and the cleft size was reduced to 6mm (Figure 7).

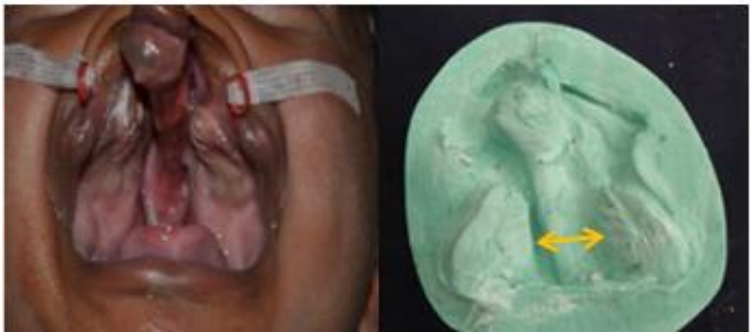

Figure 7: At 3 months, Cleft size = 6 mm

The nasal molding phase of the treatment was introduced to the patient. A nasal stent was fabricated by using an 18 gauge orthodontic wire bent into a "swan neck configuration". The paired nasal stents arise from the labial portion of the oral plate; they rise up and enter into the nasal apertures.[5] The purpose of the swan neck configuration is to ensure that the prolabium is positioned safely between the nasal stents and also allow access for lip taping during the columellar elongation phase.[5] The tip of the nasal stent was acrylized and inserted into the nostrils. This mechanism exerts an anterior force on the nasal tip on both sides to elevate the nasal cartilages.[5] A reciprocal force will be applied on the premaxilla pushing it further intraorally, thereby achieving the final few millimeters of retraction (Figure 8).[5]

The last phase of treatment was columellar elongation. A saddle or a prolabial band was fabricated at the lip-columella junction and attached to the two nasal stents. A customized prolabial band was fabricated using orthodontic elastics wrapped around the two nasal stents. The band was covered with a layer of Steri strip to prevent ulceration of the skin. The band pushes the base of the columella and directs the expansion forces to protect the nasolabial ridge.[5] The downward pull of the surgical tape at the prolabium combined with the posteriorly directed force applied at the nasolabial fold from the horizontal

band and the upward and anterior force applied to the tip of the nose by nasal the nasal stents results in stretching and lengthening of the columella (Figure 8).[5]

Figure 8: Nasal stent with prolabial band

This procedure was continued for three months. At the age of 6 months, the size of the cleft had reduced from 12mm (at birth) to 4 mm (Figure 9). The infant was taken for lip correction surgery at 6 months of age (Figure 9).

Figure 9: At 6 months, during lip correction surgery, Cleft size = 4mm

In the course of treatment, regular visits to the pediatrician reassured us about the normal growth and weight gain by the baby. The parents were enthusiastic participants in the treatment and were highly satisfied with the facial appearance, feeding and general outcome of the treatment (Figure 10).

Figure 10: Pre-operative and post-operative image

4. DISCUSSION

Throughout the ages, various treatment modalities have been put forth for the management of cleft lip and palate. The first surgical treatment of cleft lip and palate was documented as early as 317AD, when a Chinese General Wei Yang Chi had his

cleft lip corrected by cutting and stitching the edges together. History of palatal obturator dates back to 384-328B.C, when Demosthenes used coast pebbles to cover his palatal defect.[6] Since then various authors have described different surgical techniques for correction of cleft lip (Pierre Franco 1556, Ambroise Pare 1575, Tennison 1952, Millard's technique 1960).[6]

The concept of presurgical infant orthopedics (PSIO) was developed in the 1950s to further improve the esthetic result of lip repair. McNeil developed an intraoral device to reposition the alveolar cleft segments. This was introduced as an adjunctive neonatal therapy for the correction of cleft lip and palate. One of the problems associated with this technique was that it failed to address was the deformity of the nasal cartilages in unilateral and bilateral cleft lip and palate and the deficiency of columellar tissue in infants with bilateral clefts.[7]

Grayson described a hypothesis called Presurgical Nasoalveolar molding (PNAM) in the 1950s, based on which many devices were developed.[8] PNAM represents a paradigm shift from the traditional method of PSIO. This method utilizes the malleable nature of the immature nasal cartilage and its ability to maintain a permanent correction of its form. PNAM has evolved over the past decade into its present form through contributions made by practicing clinicians and parents. The treatment protocol for PNAM requires meticulous planning and attention to detail during adjustments as the adjustments maybe a few millimeters in dimension.

The concept of PNAM tackles the problem of nasal deformities.[9] This includes an increase in nasal height, reduction of nasal base width[9], elongation of the columella and realignment of the nasal septum into an upright and more midline position, improvement of nasal tip projection and convexity of lower alar cartilages.[10] If the nasal structures are brought into a near normal position before surgery, primary surgical lip and nose repair leads to more predictable and more esthetic results, less complicated surgery and minimal scar formation. Therefore, multiple surgical revisions are possibly avoided.[10, 11]

In the long run, studies show that the change in nasal shape is stable[12] with less scar tissue and better lip and nasal form. This improvement reduces the number of surgical revisions for removal of excessive scar tissue, closure of oronasal fistulas, and correction of nasal and labial deformities.[13] The adult teeth have a better chance of erupting in a good position with adequate periodontal support as the alveolar segments are in a good position with increased bone support.[13]

The approximation of the alveolar processes before surgery also enables the surgeon to perform gingivoperiosteoplasty (GPP) successfully. Santiago et al found that 60% of patients who underwent NAM and GPP did not require secondary bone grafting.[14] Sato et al found that, in the remaining 40% who did need a bone graft, there was more bone remaining in the graft site than in patients who did not previously undergo GPP.[13] Fewer surgeries result in substantial cost savings for families and insurance companies.[14] Another important benefit of NAM is the opportunity for the parents to take part actively in the rehabilitation of their child. Midfacial growth in the sagittal and vertical plane was not affected by NAM and GPP. Since the initiation of NAM, there has been a significant difference in the outcome of the primary surgical cleft repair. With proper training and clinical skills, NAM has demonstrated tremendous benefit to the cleft patients as well as to the surgeon performing the primary repair.[16]

However, there are few complications associated with PNAM therapy. As the appliance has to be worn for 24 hours, such long term usage can lead to mucosal irritation and ulceration. Ulceration of the tissues may occur due to pressure or rubbing or faulty appliance.[15] This can cause of breakdown of the frenal attachments, anterior premaxilla, and the posterior fauces. The molding plate must be properly relieved in all areas that are exerting excessive pressure. The intranasal lining of the nasal tip can become inflamed if too much force is applied by the upper lobe of the nasal stent.[15] The most common area of soft tissue irritation is the cheeks. Utmost care must be taken while removing the tapes slowly and gently in order to avoid irritation of the baby's young skin. The tapes should be removed slowly and carefully to avoid skin irritation. Warm water or commercially available tape removal solvents can be used to remove the tapes. Poor compliance by the parents can cause loss of valuable treatment time.[15]

Clinical skills in NAM develop over time. Improvement in clinical skills increases the efficiency in diagnosis, treatment planning and execution of PNAM therapy. A good clinical setup, with emergency resuscitation equipment, trained personnel is mandatory for treating such cases. Good knowledge of the concept and the movement of the dentoalveolar segments is necessary to make decisions on where acrylic should be removed and where soft liner must be added. Properly training laboratory technician must be employed to make adjustments to the molding plate under direct supervision of the practicing clinician. The advantages of PNAM are numerous. Proper treatment planning and execution will deliver the best results for the patient. Since the initiation of PNAM and the associated surgical technique, there has been a significant difference in the outcome of primary surgical cleft repair.

REFERENCES

[1] Watted A, Watted N, Abu-Hussein M. Multidisciplinary Treatment in Cleft Lip and Palate Patients. J Dental Oral Health. 2020;2(1):12.

[2] Grayson BH, Santiago PE, Brecht LE, Cutting CB. Presurgical nasoalveolar molding in infants with cleft lip and palate. The cleft palate-Craniofacial journal. 1999 Nov;36(6):486-98.

[3] Bhutiani N, Tripathi T, Verma M, Bhandari PS, Rai P. Assessment of treatment outcome of presurgical nasoalveolar molding in patients with cleft lip and palate and its postsurgical stability. The Cleft Palate-Craniofacial Journal. 2020 Jun;57(6):700-6.

[4] 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.

[5] Taylor T. Clinical Maxillofacial Prosthetics; 2000 Quintessence Publishing Co, Inc

[6] 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.

[7] Matsuo K, Hirose T. Nonsurgical correction of cleft lip nasal deformity in the early neonate. Ann Acad Med Singapore 1988; 17: 358-65.

[8] Grayson BH, Cutting C, Wood R. Preoperative columella lengthening in bilateral cleft lip and palate. Plast Reconstr Surg 1993; 92: 1422-3.

[9] Pai BC, Ko EW, Huang CS, Liou EJ. Symmetry of the nose after presurgical nasoalveolar molding in infants with unilateral cleft lip and palate: a preliminary study. Cleft Palate Craniofac J 2005; 42: 658-63.

[10] 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.

[11] Grayson BH, Maull D. Nasoalveolar molding for infants born with clefts of the lip, alveolus, and palate. Clin Plast Surg 2004; 31: 149-58

[12] Lee C, Grayson B, Cutting C. The need for surgical columella lengthening and nasal width revision before the age of bone grafting in patients with bilateral cleft lip following presurgical nasal molding and columella lengthening. Scottsdale: American Cleft Palate–Craniofacial Association; 1999. In: Program and Abstracts of the 56th Annual Session of the American Cleft Palate–Craniofacial Association.

[13] Sato Y, Grayson B, Barillas I, Cutting C. The effect of gingivoperiosteoplasty on the outcome of secondary alveolar bone graft. Seattle: American Cleft Palate–Craniofacial Association; 2002. In: Program and Abstracts of the 59th Annual Session of the American Cleft Palate–Craniofacial Association. p. 51.

[14] Santiago P, Grayson B, Cutting C, Gianoutsos M, Brecht L, Kwon S. Reduced need for alveolar bone grafting by presurgical orthopedics and primary gingivoperiosteoplasty. Cleft Palate Craniofac J. 1998;35:77–80.

[15] Grayson BH, Maull D. Nasoalveolar molding for infants born with clefts of the lip, alveolus and palate. Cleft lip and palate. 2006:451-8.

[16] Grayson BH, Shetye PR. Presurgical nasoalveolar molding treatment in cleft lip and palate patients. Indian Journal of Plastic Surgery. 2009 Oct;42(S 01):S56-61.