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Presurgical nasoalveolar moulding – A boon for the unpreviledged: A case report

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Introduction

Clefts of the lip and palate (CLP) are common birth defects of complex etiology, affecting 1 in 700. (1)(2)The use of the Nasoalveolar Moulding Plate has a positive correlation with the clinician's skills. For example, force acting on the nose tip produced by the nasal stent will produce a reaction force, which goes against the retention of molding plate and makes the molding plate move downward.

The nose, lips, and maxillary arch of the newborn are often severely distorted and asymmetric. Treatment of CLP ideally involves a multidisciplinary team. Presurgical Nasoalveolar molding (PNAM) was first described by Grayson et al and is a widely accepted approach applied before cheiloplasty for infants with CLP. The procedure requires weekly visits over a period of 2-3 months, which is time consuming, especially for patients who live in remote regions. (1)(3)(4)

A high degree of plasticity is seen in the cartilages of infants in the first few months after birth. Matuso et al postulated that a high amount of maternal estrogen caused an increased amount of hyaluronic acid in the fetal cartilage, rendering it plastic. Hence active soft tissue and cartilage molding is most successful during the first 3–4 months after birth. (5)(6)

The primary aim of PNAM is a reduction in the soft tissue and cartilaginous cleft deformity to facilitate surgical soft tissue repair in optimal conditions under minimum tension to minimize scar formation. It allows stimulation and redirection of growth for the controlled predictable

repositioning of the alveolar segments and gives the ideal arch form, normalizes the tongue position, aids in speech development, improves appearance and gives a psychosocial boost, and improves feeding and bone contour. (7)(6)

The present case report describes the treatment of a neonate with unilateral CLP by molding the nasolabial morphology and alveolar arch.

Keywords: Unilateral Cleft Lip, Molding Plate, Nasal Hook, Cleft Gap

Diagnosis and Etiology

A 10-day-old healthy female neonate unable to breast-feed and swallow because of lip and palatal defects was brought to the Department of Orthodontics and Dentofacial Orthopaedics, Coorg Institute of Dental Sciences, Virajpet for consultation. Before treatment, a recent medical examination report including hem analysis and chest radiography was provided by the patient's parents, which was not significant. History of infection, vitamin deficiencies, drug ingestion, chemical stimulus, and traumatic stress during pregnancy was absent.

Extra and intraoral photographs were taken and information regarding the objectives and proposed treatment was provided to the parents, who gave consent for their daughter’s treatment. (FIG 1) She had a markedly sunken nasal wing at the cleft side and alveolar segment displacement .The intraoral cleft gap was 13.5 mm. The defect was diagnosed as a non-syndromic unilateral complete cleft of lip, alveolus and palate. A stepwise approach (Lip taping, plate molding and nasal J hook) was planned for PNAM, followed by surgery. (FIG 2)

Treatment Objectives

The treatment objectives were to reduce the width of the cleft gap, close the intraoral alveolar segments, normalize the alveolar arch form, approximate bilateral lip tissues and distinctly improve the morphology of the nose by correcting flattened nasal wings and finally to allow a surgical repair with minimal tension.

Figure 1: Pre Treatment Photographs

Treatment Progress

After explaining the procedure and treatment goals to the parents, a putty impression was taken. The infant was fully awake, without anesthesia. Her head was gently held in a slightly supine position during the impression procedure. She was allowed to cry freely to ensure the adequate breathing during the impression making procedure.

Impressions were taken in a special impression tray fabricated by an orthodontist using silicon rubber at the initial visit and after treatment. Care was taken to ensure that the material registered the border regions of the maxilla as well as the cleft region. When the material had fully polymerized, the impression was removed and

inspected to ensure that all desired landmarks had been captured. (FIG 3)

Figure 2: Lip Taping

The cleft region of the palate and alveolus was blocked out and normal anatomic contours were built with base plate wax. The impression was then poured using type III gypsum product (dental stone) and Presurgical Nasoalveolar mold plate was fabricated using acrylic. (FIG 4) The size of the cleft was measured on the cast using a Vernier caliper. The distance from the base of the alveolus on one side to the other was found to be 13.5 mm.

Figure 3: Arbitrary Cast

Treatment was started on the same day with Steri-Strip used to bring lips together. Artificial skin (Hydrocolloid Adhesive Medical Tape) was clung to the infant's cheek as the base to protect the skin. The parents were instructed to start taping the lip across the cleft gap; from one side of the cheeks to the other side .The Steri-Strip was pulled to achieve an activation force of approximately 120 g. Patient was recalled after 3 days.

Figure 4: Pnam Plate

On the third day the molding plate was inserted and the infant observed for a few minutes to ensure that he was able to suckle while the appliance was stabilized with an index finger. (FIG 5) Thinner tape strip was subsequently wound around the retentive button and affixed to the base tape to hold the appliance against the palate. The parents were trained to insert, tape, remove, and clean the appliance. Instructions were given to keep the appliance in the oral cavity for 24 hours a day except during cleaning. Tapes were changed twice a day to make sure that the orthopedic force was strong enough, because suckling would wet the tapes.

Two thicknesses of adhesive tapes were used for retentive taping .The thicker adhesive tapes (0.5 x 2 inches) were secured onto the cheeks of the patients, superior and lateral to the commissures while the thinner tape was looped around red orthodontic elastic. The loops were

secured onto the larger base tapes with additional adhesive tapes. The direction of the force exerted by the loops was ensured to be lateral and superior. The parents were taught the procedure for retentive taping and were advised to change the tapes every day or whenever the tapes peeled off. Patient was asked to report after two weeks.

Figure 5: Pnam Plate

After two weeks the cleft of alveolus reduced by 2mm and lip segments approximated by 1mm. (FIG 6) We decided to continue the molding plate and the patient was recalled after 3 weeks. After one and half months of starting treatment when the size of the cleft was reduced to 8 mm, a nasal hook in the form of “J” was constructed with 19 gauge round stainless steel wire and used synchronously with the intraoral molding plate. (FIG 7) The superior portion was adjusted to fit passively in the nostril. The nasal part of the wire was then covered with self-cured clear acrylic with soft liner lining to support the nostril to the desired extent. The J hook was attached from the nose to the forehead with the help of a tape. The magnitude of force was determined based on whether there is change in the color of the nose tip. Force was increased until the tissue blanching was seen at the nose tip. (FIG 8) Patient’s mother was asked to change the tape connecting the nasal hook and the forehead every day to make sure that the orthopedic force was strong enough to elevate the nasal tip on the cleft side.

At the end of using the nasal J hook along with moulding plate and lip taping an additional 2.5mm of alveolar segment approximation was seen. Following 11 weeks of active treatment with lip taping and molding plate with J hook; there was reduction in the cleft of the alveolus to 5.5 mm and approximation of the lip segments. Immediately surgery for lip closure was performed. (FIG 9)

Figure 6: Post 2 Weeks Pnam Plate Insertion

Figure 7: Nasal J Hook Inserted Along With Pnam Plate

Figure 8: Nasal J Hook Pulled Superiorly Along With Pnam Plate

Treatment Results

Through this procedure, the shape of the alveolus and nose were gradually molded to resemble the normal shape of these structures. The objectives, which were set prior to treatment start, have been met at the end of treatment. Pre and posttreatment extra oral photographs revealed an improvement in the vertical level of the nasal alae. (FIG

10)

Figure 9: Pre Surgical

The distance from the base of the alveolus on one side to the other was found to be 13.5 mm at the initial appointment. After two weeks of treatment with lip taping and molding plate the cleft of alveolus reduced by 2mm and lip segments approximated by 1mm. After one and half months of starting treatment when the size of the cleft was reduced to 8 mm, a nasal hook in the form of "J" was constructed with 19 gauge round stainless steel wire and used synchronously with the intraoral molding plate. At the end of using the nasal J hook along with molding plate and lip taping an additional 2.5mm of alveolar segment approximation was seen and the nasal wing has lifted considerably. Following 11 weeks of active treatment with lip taping and molding plate with J hook; there was reduction in the cleft of the alveolus to 5.5 mm when compared to the initial 13.5mm and approximation of the lip segments prior to surgery.

This treatment technique helped to reduce the cleft gap, improve the arch form, approximate lip segments and distinctly improve the morphology of the nose by correcting the flattened nasal wings.

Discussion

Certain orthodontists prefer this approach because it produces improved results, allows repositioning of the maxillary alveolus and surrounding soft tissues and restores normal oral function. The reduced intersegment distance following PNAM improves arch symmetry and stability and thus may prevent arch collapse in the long term.(1)

Figure 10: Post Surgical Photos

The conventional procedure requires weekly visits over a period of 2-3 months, which is time consuming, especially for patients who live in remote regions whereas the procedure, which we adapted, required less frequent visits. The nasal J hook, which was a modification of the nasal stent, has shown to have few advantages over the previous design. It may have aided in retention of the molding plate as the force was directed from the forehead rather than the PNAM plate along with ease of fabrication. The conventional procedure, which had the primary impression making with wax sheet, has been bypassed in this procedure saving the patient an extra appointment. The PNAM devices currently reported in the literature are mostly single piece architectures. Interaction force between nasal stent and intraoral molding plate would reduce the efficacy and accuracy of the whole device. This method adapted by us to utilize nasal J hook may have solved this issue.

With the advantages mentioned there are few limited disadvantages. The curative effect is affected by the cooperation of patients' parents to some extent. They usually have no professional backgrounds in medicine and are unable to control the magnitude of force exerted on cheeks by the Steri-Strip. Excessive force will engender quick alveolus rotation, which can lead to overlap of bilateral maxillary segments, resulting in asymmetric alveolar arch form and T-type deformity. Conversely, insufficient force would hinder the closure of the bilateral segments before cheiloplasty, increase the surgical tension and adversely affect the maxilla after natal development, contributing to an unaesthetic concave profile.(8)(9)

It is imperative to modify procedures to make the treatment cost-effective and more convenient to the patient. As shown above, the width of the alveolar cleft and the sagittal arch length of the anterior arch decreased with the use of the PNAM. The contour of the alveolus was normalized without collapsing of the alveolar segments. The relative width of the nose was generally perceived to be narrowed by the nasal hook treatment, with a simultaneous lengthening of the Collumella. (1)(10)(11)(12)

Conclusion

This clinical report describes an approach to the management of an infant with unilateral CLP. PNAM treatment helped to reduce the cleft gap, improve the arch form, approximate lip segments and distinctly improve the morphology of the nose by correcting flattened nasal wings. With proper training and clinical skills, this treatment procedure has demonstrated tremendous benefit to the cleft patient as well as to the surgeon performing the primary repair.

Long-term studies of PNAM therapy indicate that the change in the nasal shape is stable with less scar tissue and better lip and nasal form. Since the initiation of NAM, there has been a significant difference in the outcome of the primary surgical cleft repair. Medical practitioners especially pediatricians should be made aware about the NAM which includes the lip taping, molding plate and the nasal J hook and its benefits. (13)

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