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Case Report

Presurgical naso alveolar moulding in a bilateral cleft lip and palate patient- A case report

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ABSTRACT

One third of all craniofacial anamolies of head and neck region are of cleft lip and palate with an incidence of 1 in 700 worldwide. In Asian population the reported incidence is 2.0 per 1000 live births or higher. This case report presents the treatment of a 1-month old bilateral cleft lip and palate baby with Presurgical Nasoalveolar Molding, which was followed by chelioplasty.

1. Introduction

One of the most common craniofacial deformities is Cleft Lip and Palate which not only affects the facial appearance but also speech and hearing. Different treatment protocols have been tried to achieve satisfactory outcome. Treatment of cleft lip and palate with surgeries has been documented since 317AD, when Chinese General Wei Yang Chi had cut and stitched the edges of his cleft lip together.[1] Since then various surgical techniques have been advocated by various authors (Pierre Franco 1556, Ambroise Pare 1575, Tennison 1952, Millard's technique 1960).[2–4]

Decreased columella length along with increased columella width reduces the nasal esthetics. An unpleasant scar was usually left behind during the primary surgical correction as a result of excessive stretching the skin in CLP infants.[5] Hence, the concept of presurgical infant orthopaedics was developed to reduce skin stretching and improve esthetics. Mc Neil expressed the modern concept of presurgical maxillary orthopaedics in 1950 to approximate alveolar cleft segment.[6]

Matsou et al., described that increased plasticity of auricular cartilage can be reasoned by high levels of hyaluronic acid triggered by high maternal oestrogen level within 6 weeks of life. He applied this concept for nasoalveolar molding for treating nasal deformities in cleft lip patients.[7] With the above concept, Grayson et al., actively molded the nasal cartilage along with the alveolar segments with the help of an intraoral moulding plate with nasal stents.[8] Nasoalveolar molding also stimulated immature nasal chondroblasts, thereby, produced an interstitial expansion with improvement in the nasal morphology (Chondral Modeling hypothesis, Hamrick 1999).[9]

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1.1. Objectives of presurgical naso alveolar moulding

1. To actively mould and reposition the deformed nasal cartilages and alveolar processes.[10–12]
2. To place the lip segments in a more anatomically correct position facilitating lip repair without scarring.[13,14]
3. To reduce the necessity for secondary alveolar bone grafts.[12,15]

This article is a case report of a 1-month-old baby with bilateral cleft lip and palate treated with naso alveolar molding with help of nasal stent.

2. Case Report

A 1-month old male baby was referred from surgery department for naso-alveolar molding treatment of cleft lip and palate. On clinical examination, the patient showed complete bilateral cleft lip and palate deformity. After clinical assessment of the case, the parents were explained about naso-alveolar molding, its advantages and possible complications.

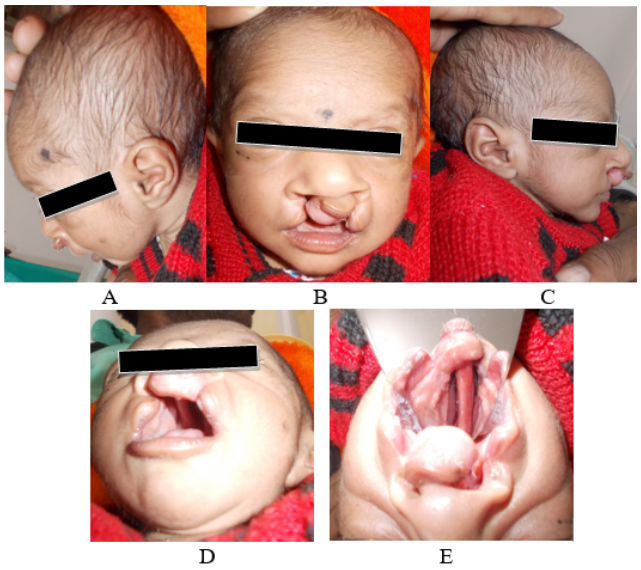

Figure 1: a:, b:, c:, Pre-treatment extra oral photographs of patient of one-month age at the start of treatment. d:, e: pre-treatment intra oral photographs.

The functional benefits of appliance to the infant such as better feeding without nasal regurgitation along with the complications such as ulcerations due to rough areas on the plate and erythema on the cheeks due to improper tape removal were also explained.

Intraoral primary impression of upper arch was made using modelling wax sheet dipped and softened in mild warm water. Primary cast was poured and a special tray was fabricated using acrylic resin to record the secondary impression. On the same appointment, secondary impression of the cleft was made using an elastomeric material on the special tray. The infant was held upside down by the mother during impression to keep the tongue forward and to allow fluids to drain out of the oral cavity thereby preventing the possible aspiration of regurgitated stomach contents. During the impression-making procedure, the infant was made to cry, to prevent the blockage of airway. The tray was placed until impression material begun to extrude past its posterior border. The tray was removed after the setting of the impression material, and the mouth was examined for any left residual impression material. The impression material posterior to the tray was cleared using finger motion thereby, preventing the infant from closing on the tray and compromising airway.

Figure 2: a: PNAM appliance, b: Patient with PNAM appliance and lip taping

Two stone casts were poured, one was used as working model and the other as study model. The alveolar cleft along with any undercut areas on the working model were blocked. An auto polymerizing acrylic resin (DPI-RR Cold Cure, India) was used to construct a moulding plate of thickness not more than 2 mm lined with a thin coat of soft denture material. The border of the plate in the labial frenum attachments and other areas were carefully reduced that are more prone to ulceration. Appliance was checked in the infant's oral cavity on the second visit only after the appliance was checked for smoothness and no rough areas. Proper fit of the appliance was checked by making the infant attempt to suck on the plate during the trial procedure. Parents were shown how to place the appliance and instructed to keep the appliance in the child's mouth full time, and clean it with cotton dipped in cold water, at least once a day.

The positioning of acrylic retentive button was crucial, so the acrylic button was positioned in a way so that it allows lip approximation and vertically it lied among the upper and lower lips. The acrylic retentive button was connected to the intraoral plate with the help of auto polymerizing acrylic resin once the correct position was marked. The cleft lip segments were pulled together while centring the columella

and philtrum to establish its position on the labial border of the moulding plate. A mark was placed on the labial flange of the appliance at the cleft lip segment junction. The retention arm was attached at this point. Vertically the retention arm was kept at the middle of upper and lower lips to allow the cleft lip segments approximation and avoiding interference in the resting position of the lower lip. Retention arm was placed at an angulation of 40 degree to horizontal plane to prevent it from unseating. When these retention arms were engaged with the help of tape elastic system, for the production of proper activation force (2oz) the elastics (inner diameter 1/4 in, wall thickness: heavy) were stretched approximately two times to the resting inner diameter.

When the cleft alveolar gap was reduced to 5 mm and the alar rim achieved laxity, the nasal stent was added on the right side for moulding of the right columella. The stent was made of .036 gauge round stainless-steel wire. It extended forward then curved backward (in the form of a swan neck) going through 3–4 mm past the nasal aperture. After the nasal stents were added, attention was focused on the nonsurgical lengthening of columella. Whereas on the left side columella lengthening was achieved attaching the nasal hook to the forehead using surgical tape and elastics. The nasal hook elevates the nose upwards and thus helps in columella lengthening.

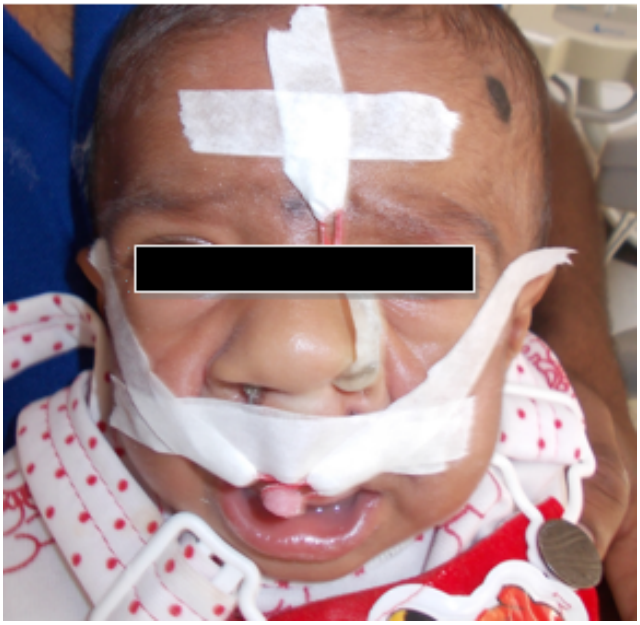

Figure 3: PNAM appliance with nasal hook

The appliance was secured to the cheeks extra orally, by surgical tapes bilaterally, which had an orthodontic elastic band at one end. Lip taping was done using SteriStrip (3M Steri-StripTM). For columellar lengthening tape was adhered to the prolabium, underneath the horizontal lip tape, and stretched downward to engage the retention arms with elastics. The horizontal lip tape was added after the vertical prolabial tape was in place.

The appliance with nasal stent and nasal hook was delivered and the phase of nasal cartilage moulding was started. This pressure aided in moulding the nasal tissue and lifting the collapsed nostril. During follow up visits, the nasal stent was modified by adding cold cure resin and the moulding plate was modified by relining using soft liner to approximate the alveolar segment in a desired anatomy and to achieve the desired columellar lengthening.

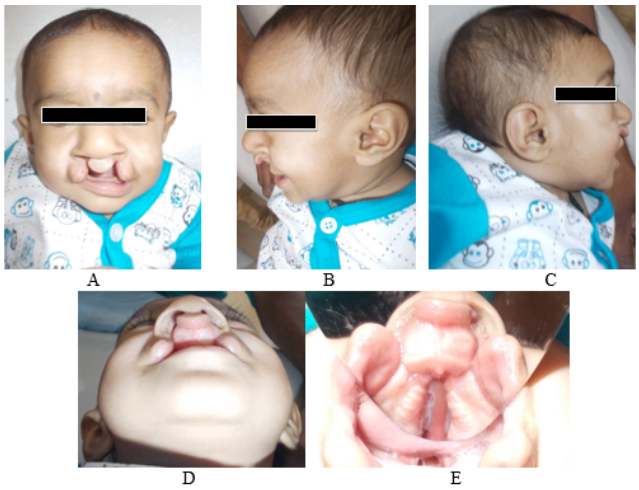

Figure 4: a:, b: c: post-treatment extra oral photographs of patient at four months age at the start of treatment. d:, e: post-treatment intra oral photographs.

3. Result

At the end of nasoalveolar molding using nasal stent and nasal hook, there was reduction in the alveolar cleft and lengthening along with repositioning of the columella to an upright position from an oblique position resulted in improved nasal alar cartilage symmetry. Significant improvement in nasal esthetics with enhancement of nasal tip projection, columella size and lower lateral cartilages positioning along with lip segments approximation was also observed.

4. Discussion

PNAM was introduced by Grayson et al.,[8] who adopted moulding cartilages from birth to 6 weeks of age as proposed by Matsou. Matsuo et al. surgically treated congenital auricular deformities in early neonatal period by taking advantage of plastic auricular cartilage at birth.[7] However, with age, there is decrease in the flexibility of the auricle. However, in the early neonate period alar cartilage and auricular cartilage exhibit the same elasticity. The major objective of PNAM is approximation of the alveolar segments and decrease in the cartilaginous and

soft tissue nasal deformity, thereby aiding in surgical soft tissue repair under minimum tension with minimized scar formation.[16]

Looking at the innumerable benefits of PNAM therapy, which was used in this case, a marked cleft width reduction in cleft alveolar segments was achieved. Numerous studies have been documented with the technique of PNAM therapy with subsequent different treatment procedures in the management of cleft patients. However, very few studies with the actual changes in nasal symmetry and arch dimensions after PNAM therapy have been reported.[8,17–19] Huddart reported a 50% palatal cleft width reduction, along with narrowed lip and alveolar clefts with the help of presurgical orthopaedics alone.[20]

At present, the routinely used PNAM techniques are Grayson's technique, Liou's technique and Figueroa's technique. PNAM with nasal stent appliance used in our case is a blend of intraoral moulding orthopaedic appliance with an additional nasal hook for nasal molding. Mishra et al., and Ezzat et al., stated a significant increase in the nostril height and columellar length with PNAM therapy.[21,22] Kirbschus et al., reported lifting of nasal dome with the use of an appliance consisting of an acrylic pellete (attached to the maxillary plate with a wire) and approximating the cleft edges closer by activating it regularly.[23] In our case, it can be concluded that there is a substantial role of the presurgical naso-alveolar molding with nasal stent attached to it and nasal hook, in the comprehensive treatment of cleft lip and palate. It improved nasal symmetry, reduced nasal tip deviation, and decreased interalar discrepancy. When nasal stents were attached to the alveolar moulding appliance, the benefits of nasal moulding at an early age were evident from the distinct improvement of the nasal morphology and improved nasal esthetics. Significant reduction of the cleft lip segment, alveolar gap and nostril diameter post moulding was also seen in our case. Lip taping offered outward pressure to approximate cleft lip segments to each other and diminished tension on upper lip before and after lip repair, reducing scar formation.

5. Conclusion

PNAM with nasal stent appliance significantly improved the retention of moulding plate. The pre-surgical naso-alveolar molding assisted primary reconstruction employing this appliance resulted in an overall enhancement in the aesthetics of the nasolabial complex in cleft conditions while diminishing the total number of surgical procedures and the extent of surgery.

6. Source of Funding

None.

7. Conflict of Interest

None.

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