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Presurgical Nasoalveolar Moulding in Unilateral Cleft lip and palate Using Head Gear

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Abstract

Nasoalveolar reconstruction for patients with cleft lip and palate is a challenging job for the surgeon. Many procedures to obtain esthetic results and decrease the cleft gap have been suggested. Presurgical Nasoalveolar Molding (PNAM) is used as an adjunct for reshaping the alveolar and nasal segments prior to surgical repair. Rehabilitation of cleft lip and palate usually requires a team approach which includes a Plastic Surgeon, Orthodontist, Speech Therapist, Pediatrician and a Prosthodontist. The objectives of Presurgical Nasoalveolar Molding (PNAM) involve correcting lip segments, lower lateral alar cartilages, and alveolar cleft segments. This article describes the use of headgear as an adjunct to molding device in the reduction of unilateral cleft lip and palate.

Key words: Presurgical Nasoalveolar Molding (PNAM), cleft lip and palate, headgear.

Introduction

Cleft lip and palate is one of the commonly occurring congenital defects in new born. It affects about 1.5 per 1000 live births (250,000 new cases per year) worldwide. The incidence appears high among Asians, about 0.82-4.04 per 1000 live births10. In Indian Scenario, the prevalence is about 27,000 and 33,000 clefts per year[7]. Children with CLP/CPA face a wide variety of medical issues and medical complications [6]. Unilateral clefts are nine times as common as bilateral clefts, and occur twice as frequently on the left than the right. The ratio of left: right: bilateral clefts are 6:3:1. Males are predominantly affected by CL± P (M:F 2:1) whereas females are more commonly affected by isolated CP[8]. The unilateral cleft deformity is characterized by a wide nostril

base and separated lip segments on the cleft side. The affected lower lateral nasal cartilage is displaced laterally and inferiorly, which results in a depressed dome, the appearance of an increased alar rim, an oblique columella, and an overhanging nostril apex. If there is a cleft of the palate, the nasal septum deviates to the non-cleft side with an associated shift of the nasal base[4] .Since its introduction in 1950s Presurgical Nasoalveolar Molding treatment protocol has helped to get the cleft segments as well as the lip defect closer, making surgical repair more easier with less chances of relapse, incorporating nasal stent can even correct the collapsed ala of the nose. Thus Pre surgical Nasoalveolar mouldings primary aim is to reduce soft-tissue and cartilaginous deformity that's enable surgical soft-tissue repair to optimal conditions under minimal tension so that scar formation [3, 4] is minimized, especially in patients with Unilateral Cleft Lip and Palate (UCLP). The management of cleft lip and palate represents a commitment to the care of the afflicted child over the course of the child's development into adulthood[5].

Case Report

A 5 day old female patient with a right sided unilateral cleft lip and palate, with no significant medical history, reported to the Department of Prosthodontics, H.K.E.S's S. Nijalingappa Institute of Dental Science and Research, Kalaburagi, Karnataka. From the frontal view, the face was asymmetric due to unilateral complete cleft involving lip and alveolus of right side. There was a deviation of the nasal tip from the facial midline towards the left side and a deformed right nasal dome with significant flattening, the shortening of columella with deviation and also shortening of the philtrum. (Fig 1-a) The intra- oral view revealed a complete cleft involving the anterior alveolus, hard palate and the soft palate. The unilateral nature of the cleft palate had divided the palate into a larger left half or the major segment and the smaller right half or the lesser segment. The major segment (left half) was more anteriorly placed, rotated anteriorly and laterally while the lesser segment (right half) was rotated posteriorly and inward. (Fig .1-b).

Fig 1-a deviation of the nasal tip,shortening of columella

Fig 1-b major segment (left half), rotated anteriorly, while the lesser segment (right half) was rotated posteriorly and inward

Treatment Objectives

The main aim of the treatment with PNAM was to redirect the growth of the palate and to bring the segments of the palate and lip closer to aid in effective surgical repair and to uplift the collapsed ala by adding the nasal stent. Method The primary impression of the gum pads and the cleft region was made with impression compound. The model was poured with dental stone. (Fig 2-a)The undercuts of the cleft region was blocked out with modelling wax (fig.2-b) and a clear acrylic feeding plate was fabricated (fig.2-c). 2 orthodontic wires extending to the cheek region on either side were incorporated in the feeding plate to aid in the retention (fig.2-d). The feeding plate was inserted on the same day. The NAM treatment was deferred until the child had turned 1 month of age.

Fig-2a- poured dental stone model, **b**- undercuts of the cleft region was blocked out with modelling wax, **c**- clear acrylic feeding plate; **d**-2 orthodontic wires extending to the cheek region on either side were incorporated in the feeding plate to aid in the retention.

Over the primary cast, a spacer of modelling was adapted (fig.3-a) and a special tray was fabricated with autopolymerising acrylic resin. Multiple perforations were made in the tray. The child was recalled after 3 weeks and a definitive impression was made with putty consistency Polyvinyl Siloxane relined with light bodied PVS (3MESPE) (fig.3-b). A definitive cast was made with Type 3 Dental Stone. A NAM appliance was fabricated on it with clear acrylic resin. An acrylic button was incorporated on its cameo surface anteriorly with a notch to engage the elastics (Fig.3-c). The child was recalled after a week when the baby had turned one month old. The NAM appliance was inserted into the baby's mouth, ensuring there were no sharp edges and rough surfaces to cause irritation or injury. The acrylic button was jutting out in between the lip segments (Fig.3-c). A cervical head strap was used to take cervical anchorage. The head gear was modified on the sides to incorporate an orthodontic wire with a loop. 2 Red elastics were engaged onto the acrylic buttons and were stretched twice their length and inserted into the wire loops on the head gear. Skin friendly adhesive tapes were stuck onto the child cheeks to prevent the elastics from injuring the skin (Fig.3-d).

Fig.3 a- spacer of modelling. **b**- definitive impression was made with putty consistency PVS. **c**- acrylic button was incorporated on its cameo surface anteriorly with a notch to engage the elastics **d**- Skin friendly adhesive tapes were

stuck onto the child cheeks to prevent the elastics from injuring the skin

The parents were asked to change the elastics every alternate day. The child was recalled weekly and diagnostic impressions were made in putty to evaluate the progress of the treatment. After the first month of the treatment, lip taping was added in the treatment protocol followed by application of the nasal stent. For the nasal stent, an orthodontic wire was bent in a Swan shape and an acrylic bean shaped dome was incorporated at the end of the wire (fig.4a). This dome gets inserted into the collapsed nose to lift it up. The advantage of using headgear in our case is that it provided us with a stable anchorage which is not so in case of support from cheek which is a movable tissue. Thus headgear can be used as better adjunct in the reduction of cleft lip and palatal defect. Addition of self-cure soft liner was added on the inner aspect of the buccal flange of the major segment and palatal surface of the minor segment to accommodate and facilitate the movements of the cleft segments (fig.4-b). This was repeated at each evaluation appointment.

Fig .4a- nasal stent, an orthodontic wire was bent in a Swan shape and an acrylic bean shaped dome was incorporated at the end of the wire

Fig.4-b self-cure soft liner was added to facilitate movements of the cleft segments

Result

Measurements of inter segment distances were made considering two reference points on the crest of the gum pads, one is the anterior most points on the gum pads and the other is junction between middle and the posterior third (fig 5).

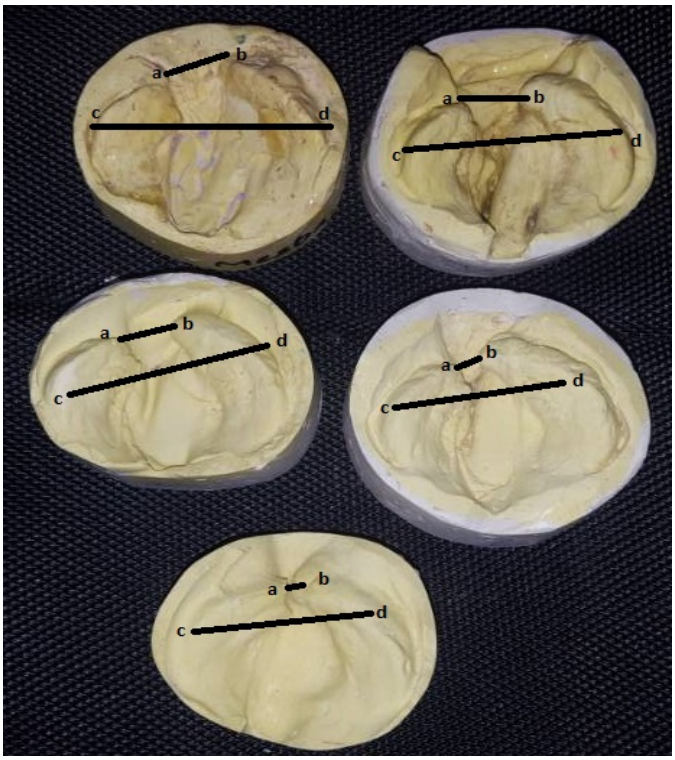

Fig.5 : Image 1- at the first appointment ,image 2- after one week, Image 3- after 15 days, image 4- after 30 days, image 5- after 45 days .

Table 1 –showing distance between a-b and c-d

Sr No	Image	Distance From A-B	Distance From C-D
1	Image 1	13mm	38mm
2	Image 2	12mm	34mm
3	Image 3	9mm	33mm
4	Image 4	5mm	32mm
5	Image 5	1mm	31mm

Frontal view of the patient after completion of the treatment (fig 6).

Fig.6- Before and after completion of the treatment

Discussion

In the past, there have been numerous techniques advocated for a non-surgical reduction in the size of the alveolar cleft. Matsuo and Hirose utilised an intraoral acrylic appliance similar to an obturator to approximate the alveolar segments[1]. Grayson et al. in 1993 had first introduced the PNAM technique. However various modifications have also evolved to this technique. The goal of PNAM is to align and approximate the alveolar cleft segments while at the same time achieving correction of the asymmetric nasal cartilage and soft tissue deformity. These corrections are achieved by adding a nasal stent to the labial vestibular flange of a conventional intraoral moulding plate. The nasal stent and alveolar moulding plate are adjusted gradually over a period of 5–6 months to achieve nasal and alveolar symmetry, nasal tip projection, and approximation of the cleft alveolar segments before primary lip, nasal, alveolar surgical repair. The Nasoalveolar orthopaedic appliance is held in place with a combination of adhesive tapes applied to the cheeks and cleft lip segments [9].The presurgical reduction in osseous and soft tissue cleft deformity considerably reduces the magnitude of the surgical challenge, resulting in improved surgical outcomes[2]. We did this study to evaluate the outcome of PNAM in the treatment of UCLP using head gear. The mean age at which PNAM begun was 23 days (range 2–44 days). The appliance was activated biweekly because of long distance traveling and socioeconomic status hindering the patients for regular weekly follow-ups. At the first appointment the distance between the two halves of the clefts were 13mm in the anterior most part and 38mm at the junction of the middle and the posterior third, which was gradually with the help of PNAM were reduced to 12mm and 34mm after one week, 9mm and 33mm after 15 days,5mm and 32mm after 30 days and almost closed i.e. 1mm in the anterior most region and 31mm at the junction of the middle and the posterior third after 45 days of PNAM therapy. Our patients were at the near end of the ideal cartilage moulding period, which is determined to be first 6 weeks of life. The therapy was done on an average for 120 days. Both alveolar and nasal moulding were started at the same time irrespective of the alveolar ridges cleft distance, in contrast to Grayson et al., who starts nasal moulding when the alveolar ridges were 6 mm apart. After satisfactory closure of the defect the patient was referred for surgical closure of the cleft lip and palate, which is the definitive treatment for the closure of cleft lip and palate.

Conclusion

Although the principal element for the rehabilitation of cleft lip and palate is the surgical corrections but the rehabilitation can be achieved more esthetically can be achieved with the help of PNAM techniques. Treating at

early age gives the advantage of malleability of the para-oral structures which can be utilized selectively to control growth patterns with NAM[4]. Advantages of NAM being improvement in nasal symmetry in terms of width of nostrils, height and columella angel benefit from decrease in alveolar and palatal gap width, facilitating lip repair followed by palatal closure with minimal soft tissue dissection. Hence performing PNAM before primary lip closure will give psychological reassurance to patients as well as enhancing surgical outcome, reducing need for soft tissue revision surgeries later thereby reducing the overall cost of treatment[7] . Using headgear for the primary support which was done in our case gives us the advantage over the conventional methods of using the support from the cheeks is that skull provides more stable and constant support which will help to move he segments uniformly which is not the case so when support is taken from movable tissues such as areas around cheeks which will hamper application of uniform pressures around the segments. Thus NAM has proved to be a simple yet effective adjunctive therapy for reducing hard and soft tissue cleft deformity before surgery. Despite the relative paucity of high-level evidence, NAM appears to be a promising technique that deserves further study[4].

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