

CASE REPORT



Presurgical nasoalveolar molding by orthodontic and prosthodontic approach

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Abstract

Reconstruction of nasoalveolar process in cleft lip and palate patient is challenging for surgeon. Many procedures to obtain esthetic results and decrease the cleft gap have been suggested. Before surgical repair, presurgical nasoalveolar molding (PNAM) is used to reduce the size of the defect. Team approach which includes a plastic surgeon, orthodontist, speech therapist, pediatrician, and a prosthodontist required for rehabilitation of cleft lip and palate patient. A 5-day-old female patient with a left-sided unilateral cleft lip and palate deviation of the nasal tip from the facial midline toward the right side and a deformed right nasal dome with significant flattening, the shortening of columella with deviation, and shortening of the philtrum. PNAM had been done which is an effective way of reducing the size of the hard and soft tissue defect before undergoing surgery using an expansion screw. Enhancement of surgical outcome, reduction of need for revision after surgery, as well as reduction of cost can be achieved PNAM before primary closure.

Keywords: Alveolar cleft segments, cleft lip and palate, presurgical nasoalveolar molding

Introduction

The history of surgery of cleft lip and palates reaches as far backward as the pre-Christian era to 390 B.C. when for the 1st time a cleft lip was closed successfully in China. A successful operation on a cleft palate did, however, not occur until 1816. Graefe, in 1816, and Roux, in 1819, published the first satisfactory results.^[1] Repair of cleft lip with non-surgical correction of the nasal deformity in the early neonatal period.^[2] The presurgical reduction in osseous and soft tissue cleft deformity considerably reduces the magnitude of the surgical challenge, resulting in improved surgical outcomes.^[3] 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. Presurgical nasoalveolar moldings (PNAM) primary aim is to reduce soft tissue and cartilaginous deformity that is enable surgical soft tissue repair to optimal conditions under minimal tension so that scar formation is minimized, especially in patients with unilateral cleft lip and palate (UCLP).^[4,5] In Indian scenario,

the prevalence is about 27,000 and 33,000 clefts per year.^[6] The global epidemiological survey states that cleft palate is present in one in every 600 newborns.^[7] Cleft lip and palate are one of the commonly occurring congenital defects in newborn. 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 births.^[8] A new approach in presurgical infant orthopedics using an alveolar molding plate with an expansion screw (Jack screw) fully opened incorporated into the appliance enabling orthodontic management is been seen as an option.^[9]

Case Report

Female patient aged 5 days with UCLP involving the left side, 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 frontal view, there was asymmetry due to unilateral complete cleft involving lip and alveolus of the left side with deviation of the nasal tip from the facial midline toward the right side and a deformed right nasal dome with significant flattening, the shortening of columella with deviation, and shortening of the philtrum.

The intraoral 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 right half or the major segment and the smaller left half or the lesser segment. The major segment (right half) was more rotated anteriorly and laterally while the lesser segment (left half) was rotated posteriorly and inward.

Methods

The patient was taken to the pedodontic department for the removal of the neonatal tooth [Figure 1] as it would interfere with accurate impression making as well as accurate approximation of segments.

The primary impression of the gum pads and the cleft region was made with impression compound. The model was poured with dental stone. The undercuts of the cleft region were blocked out with modeling wax and a clear acrylic feeding plate was fabricated. The feeding plate was inserted on the same day and parents were instructed regarding feeding using the feeding plate. The NAM treatment was deferred until the child had turned 1 month of age.

Over the primary cast, a spacer of modeling was adapted, and a special tray was fabricated with autopolymerizing 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). A definitive cast was made with Type 3 Dental Stone. A nasoalveolar molding (NAM) appliance was fabricated using an alveolar molding plate with opening the hyrax screw, and the appliance was retained in the mouth with the help of extraoral tapes.

This formed the active component of the appliance for retraction of the protruded premaxilla. The child was recalled after a week when the baby had turned 1 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. Expansion screw was activated by rotating half a turn every next week. The appliance was activated by closing the expansion screw and by selective grinding and relining with denture base material. The premaxilla was retracted, and the cleft gap was reduced with the use of this active alveolar molding appliance. The child was recalled weekly and diagnostic impressions were made in putty to evaluate the progress of the treatment.

After the 1st 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. This dome gets inserted into the collapsed nose to lift it up [Figure 2]. This was repeated at each evaluation appointment.

After the satisfactory closure was achieved with PNAM, the patient was referred for surgical closure of the defect.

Results

Measurements of intersegment distances were made considering reference [Table 1] points on the anteriormost on the crest of the gum pads [Figure 3a-c].

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 utilized an intraoral acrylic appliance similar to an obturator to approximate the alveolar segments.^[4] Grayson *et al.*, in 1993, had first introduced the PNAM technique. However, various modifications have also evolved to this technique.

PNAM aims to approximate cleft segments as well as correct asymmetric nasal cartilage and soft tissue deformity. Corrections are achieved by adding nasal stent which are gradually adjusted over a period of time along with the molding plate for proper approximation of the segments. The nasoalveolar orthopedic



Figure 1: Neonatal tooth



Figure 2: Swan-shaped nasal stent

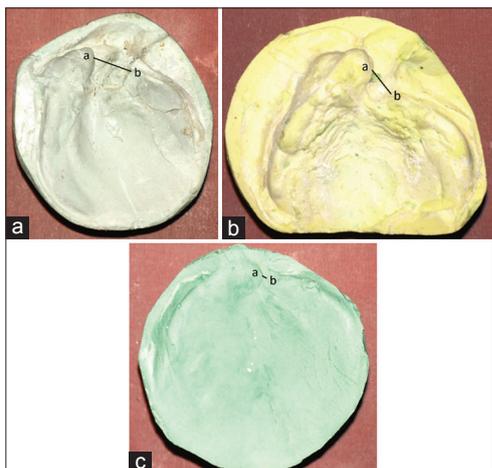


Figure 3: (a) at first appointment (b) after 20 days (c) after 40 days

Table 1: Measurements of intersegment distances

Image	Distance from a to b
Figure 3-a	7 mm
Figure 3-b	4 mm
Figure 3-c	1 mm

appliance is held in place with a combination of adhesive tapes applied to the cheeks and cleft lip segments.^[7]

We did this study to evaluate the outcome of P NAM in the treatment of UCLP using expansion screw by combining orthodontic and prosthodontic approach. The patient was at the end of the cartilage molding period so alveolar and nasal molding started at the same time. The hyrax screw was given half a turn every 2 weeks to bring the segments close and after achieving the full closure of the screw, a new impression was made with putty and a new molding plate was fabricated by again opening the screw. 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 rehabilitation of cleft lip and palate is the surgical Corrections, rehabilitation can be achieved more esthetically can be achieved with the help of P NAM techniques.

Treating at early age gives the advantage of malleability of the paraoral structures which can be utilized selectively to control growth patterns with NAM.^[5]

NAM advantages include improvement in nostril width, height and columella, alveolar, and palatal gap width while

facilitating lip repair. Hence, performing P NAM before surgery will provide psychological reassurance as well as improve the surgical outcome.

Using expansion screw in reverse direction which was done in our case gives us the advantage over the conventional methods of putting precise pressure on the cleft segment.

Thus, NAM has proved to be a simple yet effective adjunctive therapy for reducing hard and soft tissue cleft deformity before surgery.^[5] Furthermore, long-term effects of nasoalveolar molding have not been evaluated, and therefore, further studies evaluating the long-term effects of P NAM are required to conclude firmly regarding the benefits of P NAM.^[10]

Clinical Significance

The main aim of the treatment with P NAM is 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.

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