Presurgical Nasoalveolar Molding in Early Cleft Lip and Palate Rehabilitation

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Abstract

Presurgical nasoalveolar molding (PNAM) consists of selectively repositioning the alveolar segments as well as the surrounding soft tissue by active molding. This case series documents the rehabilitation of three unilateral mid-facial cleft patients. Enhancement of surgical outcome, reduction of need for revision after surgery, as well as reduction of cost can be achieved with PNAM before primary closure.

Keywords: Alveolar Cleft Segments; Cleft Lip and Palate; Presurgical Nasoalveolar Molding

Introduction

The global epidemiological survey states that cleft palate is present in one in every 600 newborns [1]. The incidence appears high among Asians, about 0.82 - 4.04 per 1000 live births [2]. Cleft lip, alveolus and palate can be treated successfully only with the interaction between various disciplines. Grayson,, et al. described presurgical nasolaveolar molding (PNAM) as the active molding and repositioning of the deformed nasal cartilages, alveolar processes as well as lengthening of the deficient columella [3]. Early intervention helps in lessening the severity of the cleft, thus improving the esthetic outcome after the cleft lip and palate surgery.

Case Series

Case 1

A 12 day old baby girl having a midfacial cleft was referred from the department of plastic surgery to the department of prosthodontics, with the primary need of a feeder plate. Extra oral and intra oral examination revealed a left unilateral cleft lip and palate, extending onto the soft palate. Depressed nasal rim was also noted (Figure 1). It was decided to carry out PNAM. The Parents were counseled about the treatment plan and procedure and their role was explained to them.

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Impression

Primary Impressions were made in low fusing impression compound (Kerr compound, Green stick) using the handle of a size zero stock tray. The size of the cleft was measured on the resultant cast using a vernier caliper and found to be 9.8 mm (Figure 2).

Appliance fabrication and design

The cleft region of the palate and alveolus was blocked out, and a record base was fabricated in heat cure acrylic resin (Trevalon, Dentsply). The appliance was finished and polished. It was ensured that no sharp borders were present. A self-cure acrylic retentive button was attached to the labial flange at an angle of 45° to the occlusal plane (Figure 3).
Appliance insertion and molding

The appliance was tried on the baby. The intaglio surface of the plate was then modified to allow for selective pressure on the two segments of the arch using tissue conditioner (Viscogel, Dentsply). A cloth head cap with Velcro strips at the side was tailor made to fit the patient. Orthodontic elastic (tru-force latex elastic system) was looped around the acrylic button and attached to the elastic bands via hooks (Figure 4). Patient was recalled weekly and no more than 1 mm of moulding was performed at every visit. Moulding procedure continued Over 2 Months after which, the size of the cleft was determined to be 5.7 mm. Active nasal moulding was initiated. A nasal stent was constructed of 19 gauge round stainless steel wire (smith SS wire) in the shape of a “swan neck” (Figure 5). The superior loop was adjusted to fit passively in the nostril. The nasal portion of the wire was then covered with self-cure clear acrylic and then by a layer of the tissue conditioner to support the nostril until a moderate amount of tissue blanching was evident. Moulding continued for 3 weeks until the desired nasal cartilage and alveolar shape was achieved at 15 weeks. Patient was then scheduled for lip and nose surgery at 15 weeks (Figure 6). Patient was recalled after 6 months, 2 years for follow up (Figure 7).
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Figure 5: Surgical closure.

Figure 6: Surgical closure.

Figure 7: Follow up at 2 years.

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Case 2

A 17 day old baby boy reported to the Department of Prosthodontics. Extra oral and intra oral examination revealed unilateral cleft involving the right lip, alveolus and the hard palate (Figure 8). It was decided to carry out PNAM. The Parents were counseled and the treatment plan was explained to them.

![Figure 8: Preoperative photo of the child at 17 days.](image)

Impression

The baby was placed on the mothers lap and an impression was made with a low fusing impression compound and a cast was obtained in the conventional manner. The distance between the approximating alveolar segments was measured and found to be 8 mm on the master cast (Figure 9).

![Figure 9: The size of the cleft was measured to be 8 mm.](image)
Appliance fabrication and design

The cleft region was blocked out with wax and a record base was constructed with heat-cure acrylic resin. A 5 mm hole was incorporated to facilitate breathing in case of accidental dislodgement. A retentive acrylic button was attached to the labial flange to secure the orthodontic wires. The appliance was finished and polished in the same manner.

Appliance insertion

The appliance was tried on the baby. The intaglio surface of the appliance was trimmed to place tissue conditioner (Viscogel, Dentsply) to allow selective pressure on the two alveolar segments of the arch (Figure 10). A customized head cap allowed attachment of orthodontic elastic wires (2oz). The patient was recalled weekly and the molding procedure was repeated until the size of the cleft reduced to 5.6 mm at 3 weeks. A nasal stent was then incorporated into the appliance in the same. Patient was then scheduled for lip and nose surgery at 15 weeks. Patient was recalled after 6 months, 2 years for follow up (Figure 11).

Figure 10: Intaglio surface of the molded appliance.

Figure 11: Follow up at 2 years.
Case 3

A 10 day old baby girl reported to the Department of Prosthodontics. Extra oral and intra oral examination revealed nasal deformity and a displaced alveolar segment. The columella and nasal septum were inclined over the cleft with base deviated towards the non-cleft side (Figure 12).

Figure 12: Preoperative photo of the child at 10 days.

Impression

Impressions were made in the conventional manner and the intraoral cleft gap was measured to be 7.8 mm (Figure 13).

Figure 13: Master cast.
Appliance fabrication and design

The cleft region was blocked out with wax and a record base was constructed with heat-cure acrylic resin with a retentive acrylic button. A 5 mm breathing hole was incorporated.

Appliance insertion

The appliance was tried and the intaglio surface of the appliance was molded with tissue conditioner to allow selective pressure. A customized head cap allowed attachment of orthodontic elastic wires (2oz) (Figure 14). The molding procedure was repeated until the size of the cleft reduced to 5.2 mm at 4 weeks. A nasal stent was fabricated to correct the cleft nose deformity (Figure 15). Through biweekly adjustments on the bar, the columella gradually elongated. Patient was then scheduled for lip and nose surgery at 15 weeks. Patient was recalled after 6 months, 2 years for follow up (Figure 16).

**Figure 14:** Appliance in situ.

**Figure 15:** Naso alveolar molding appliance with the nasal stent.
Discussion

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 [4]. Selective pressure was applied on the greater and lesser alveolar segments to permit molding. 1 mm thickness of tissue conditioner was applied onto the outer surface in the region of the greater segment and the inner surface was relieved by 1 mm. 1 mm thickness of tissue conditioner was also applied on the inner surface in the region of the lesser segment and the outer region was relieved by 1 mm. This caused a force that was directed inward on the greater segment and outward on the lesser segment that would cause approximation of alveolar tissue [5]. When the alveolar cleft width has been reduced to a size less than 6 mm, the nasal stent is added so that nasal cartilage molding may begin. An attempt to correct this deformity before reducing the cleft size may result in an undesirable increase in the lateral alar wall [3]. The tailor made head cap had Velcro strips at the side which provided for attachment of the elastic bands, as well as facilitated their placement and removal. Controlled movement of the alveolar segments was obtained by tight positioning of lip segments with a tape combined with the plate. The appliance is worn continuously and removed only for daily cleaning. While PNAM has been proved to be a beneficial approach, its success depends upon a modified surgical procedure for repair. The surgical procedure advised is the modified gingivoperiosteoplasty (GPP) described by Millard and Latham (1990) [6]. It is usually performed within 12 - 16 weeks of age but can be postponed if additional weeks of PNAM therapy are deemed necessary. The procedure involves a first stage primary lip nose repair with GPP to close the alveolar defect. This should be followed by a one stage palatal repair at 11 - 13 months of age when speech development in evident.

Conclusion

PNAM technique when initiated at an early age has the advantage of malleability of the paraoral structures which aids in selectively controlling the growth patterns. It is a simple yet effective adjunctive therapy which showed significant reduction in the defect size and improved contour of the columella-philtrum region for superior postsurgical esthetics.
Conflict of Interest

The authors declare no conflict of interest.

Disclosure

All authors gave their final approval and agreed to be accountable for all aspects of the work.

Bibliography


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