

Simple and Efficient technique to Fabricate PNAM device: Case report

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Abstract

Pre-surgical nasoalveolar molding device (PNAM) is a prosthetic appliance designed to minimize the size of cleft of the hard palate and assist in feeding milk. PNAM is most successful during 3-4 months of life before the cartilages lose their pliability. This case report briefly attempts to describe the Fabrication of PNAM appliance with clear-auto polymerizing resin for 3-months old infant and the simple impression technique to record cleft lip and palate defect (CLP).

Keywords: Cleft Lip and Palate; Pre-Surgical Nasoalveolar Molding (PNAM); Impression Procedure; Infant Orthopedics; Clear Auto Polymerizing Resin; Maxillofacial Defects

Introduction

Many congenital anomalies may affect Orofacial regions among which Cleft Lip and Palate (CLP) is common. Cleft palate causes oro-nasal communication due to which infant is unable to feed milk and is at risk of choking. These defects also affect the speech and overall physical and mental health of the patients [1]. Previously CLP defects were treated with multiple surgical procedures during the early phases of patients life usually between birth to 18 years of an age [2]. Different appliances have been described for infants with cleft palate and can be categorized into active or passive, depending on whether the appliance places any force on the alveolar segments or not. These appliances includes (passive plates, Latham appliance, Jackscrew devices) [1,3]. Pre-surgical Naso-alveolar molding device was invented to decrease the number of surgeries by reducing the size of the cleft without using the active surgically placed appliances thereby, decreasing discomfort, need of general anesthesia and with the added benefit of palatal coverage preventing regurgitation [4]. Impression is the first step for the fabrication of PNAM appliance and for adequate impression properly sized impression tray is required. Polymethylmethacrylate trays [5], KS-trays [5]. Impression trays made on other casts [3], wax and ice cream sticks [1]. Teaspoon [6]. Handle of small tray [7]. Guaze piece and finger as a tray [8] have been suggested for impression making but majority of these trays are not readily available, non-customized and are not easy to use.

Case report

3-months old baby with complete unilateral cleft lip and palate was referred to the department of prosthodontics for fabrication of Feeding plate. Extraoral examination of the patient revealed asymmetrical face with complete left sided cleft lip and palate, tip of the nose was deviated to the right side and collapsed left ala of the nose with significant shortage of columella and philtrum. Cleft involved both hard and the soft palate intraorally c



Figure 1



Figure 2



Figure 3

Objective

Primary objective of the treatment was to minimize the cleft size by bringing greater part and the lesser part of the hard palate closer thereby reducing pre-surgical defect and to assist in feeding milk. To achieve this, it was decided to fabricate pre-surgical naso-alveolar moulding device (PNAM) for the patient.

Method

For Impression making the patient was called earlier in the day to counter any unforeseen situation of impression dislodgement and emergency prerequisites were taken by arranging high volume suction and on-call emergency physician. Primary impression was taken by Polyvinylsiloxane (PVS) putty on to the customized stick compound impression tray (Figure 4). Stick compound impression tray was made by combining two stick compounds together with the help of hot wax knife. Half-length stick compounds were then made soft using hot water in the rubber bowl and moulded into the soft uniform mix and other half of the stick compounds were left cold to use as a Handle. The patient was held with face down leaning forward to prevent possible aspiration of regurgitated stomach contents and was cradled by her father. The soft half of the stick compounds were resoftened by dipping it in the hot-water and was carefully carried inside infants mouth and was molded to record the regions of maxilla, pre-maxilla and the cleft. During the impression making the infant was continuously crying which represents the opened airways. The set stick compounds were removed and inspected for adequate extensions (Figure 3). Surgical blade was used to scrape

and make undercuts in the set stick compounds for space and retention of the polyvinylsiloxane (PVS) impression material. Base and Catalyst of Putty PVS materials were hand mixed according to manufacturer instructions by dental assistant and used to record the impression of maxillary arch with the help of customized stick compound tray (Figure 4). Impression was removed after 2 minutes, inspected, disinfected and poured in the type IV Dental Stone to obtain 1st Master cast (Figure 5 and 6) Second pour was done to obtain 2nd cast which will serve for future referencing and record keeping.



Figure 4

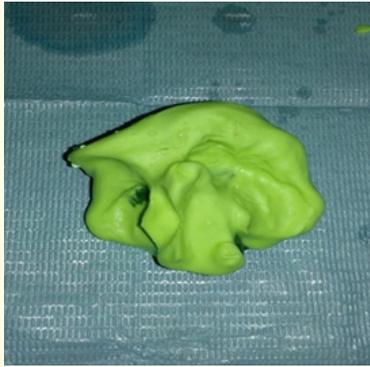


Figure 5



Figure 7



Figure 6



Figure 8

Size of the defect was measured on the master cast and mentioned in the patient's chart. The cleft region of the palate and the alveolus of the master cast was filled by molten baseplate wax to make anatomy and contour of the intact arch (Figure 7). The modified master cast was then lubricated with petroleum jelly and clear methyl methacrylate orthodontic resin using dough method was used to make clear acrylic oral molding plate with the acrylic button for extra-oral retention (Figure 8).

The molding plate was inserted inside infant's mouth to check the fit, extension and comfort. The tissue surface of the molding plate was then altered to make greater and lesser segment closer. This was achieved by 1-1.5 mm selective grinding the palatal surface of greater segment and adding 1-1.5mm tissue conditioner to the inner surface of the labial segment for overall movement of greater segment inwards. On contrary, 1-1.5mm selective grinding the inner surface of the labial segment and addition of 1-1.5mm

tissue conditioner on to the palatal surface was done to move the lesser segment outwards. These adjustments were planned after every 7 days to gradually move greater segment inward and lesser segment outward to reduce cleft gap and making both segments contact each other making an intact arch form. Extraoral Retention was achieved by $\frac{1}{4}$ inch steri-strip anchored with 0.25 inch orthodontic elastics on to the acrylic button of the molding plate. $\frac{1}{2}$ inch base tape was applied under and over the steri-strips to prevent skin irritation due to the frequent changing of the steri-strips (Figure 9). Lastly, lip taping was firmly done to bring cleft lip closer. Adequate taping was taught to the infant parents and they were told to change steri-strips at least twice daily for desired results and follow-up appointment was given for 7-days later (Figure 10).

At follow-up appointment after 7-days there was a significant visual change in the distance between the two segments and also to the cleft lip (Figure 11). Molding plate was modified in the similar manner mentioned above and all the instructions were repeated to the parents.



Figure 9



Figure 10



Figure 11

Unfortunately, Patient was unable to come for further follow-ups due to the unforeseen circumstances of gastrointestinal issue and was hospitalized. Sadly, after 2 days of hospitalization infant didn't survive hence the outcome of the appliance remained unknown.

Discussion

The molding process should begin as soon as possible after the baby is born because plasticity of both hard and soft tissues are reduced as the infant becomes older which makes molding difficult [9]. It is thought that Maternal Estrogen rises during perinatal period which causes increase in hyaluronic acid levels. Hyaluronic acid reduces cartilage, ligaments and connective tissue elasticity by breaking intracellular matrix [10]. High levels of hyaluronic acid can be transferred to infants from the mothers.

Therefore, PNAM is most successful during 3-4 months of life before the cartilages loses its pliability [11]. It is reported that feeding, tongue function and speech development improves with the prosthetic treatment and also reduces the risk of aspiration as the oro-nasal communication¹. Heavy body silicon impression material [1] and alginate [12] have been routinely employed for taking impressions of neonates with orofacial clefts. Different impression materials (alginates, addition cure putty, condensation cure putty, cartridge delivery, bite registration materials) were analyzed on a wet soaped stone model of a neonate with a cleft of the hard palate [13]. Results showed Good Surface reproducibility in Alginate and Cartridge delivery silicone systems but latter were too fluid to use in cleft infants and Alginate tends to tear the most during removal. Condensation silicones were messier to handle and Bite registration material reproduced least surface details. Best results with least flow were obtained with addition silicone. For Impression of cleft lip and palate in this Case, Polyvinylsiloxane (PVS) impression material on the customized green stick compound used as an impression tray was selected. Advantage of stick compound is that it is easily available, economical and can be removed before it sets in case of any emergency [3]. It has better resistance to tearing compared to other impression materials and can be manipulated in patients mouth to make an adequately sized tray. PVS impression materials are an accurate and safe means of recording impressions. The high shear strength of these materials make them resistant to tearing on removal and greatly improves the overall safety of the material. The role of an impression in the success of any appliance cannot be overemphasized. Not only does an accurate impression enhance the recording of detail, it also greatly improves the retention and comfort of an appliance

Conclusion

PNAM device proved to be an efficient appliance to reduce the size of the Cleft palate. This helps to restore the anatomy and con-

tour with the minimum number of surgeries. Due to early Surgical closure with minimum defect size, there is less need of later bone graft and more surgical interventions thereby causing decrease discomfort, cost, number of hospitalization visits and psychological distress.

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