

Presurgical Nasoalveolar Molding Modified Technique in Complete Bilateral Cleft Lip and Palate Infant: A Case Report

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Abstract

Through this research, we have presented a modified presurgical nasoalveolar molding (PNAM) device, protocol, and equipment of preoperative nasal alveolar formation techniques to improve lip, nose, alveolar, and palatal deformity in the Department of Orthodontics and Maxillo-Facial Department at the University of Prishtina. A two-week-old boy was brought to our Department of Orthodontics. The baby was diagnosed with non-syndrome bilateral complete cleft of the primary and secondary palate. After a complete examination and orthodontic therapeutic planning, precaution was taken for creating a PNAM appliance and sent to the laboratory. An intraoral molding plate was established on both sides of the separate segments of the maxilla and fixed with a mini screw to approximate the maxillary segments. Parts of the strings built in the front side activated (please check) and, together with the nasal stent, were added to correct the nose deformity. By using modified NAM to close the cleft segments, both the ones of the upper lip and the ones of the palate, we achieved the same results and reduced possible tissue damage by maintaining the conventional NAM apparatus. We used an alveolar formation plate with traction stainless steel to reduce the separate parts. Under this presurgical treatment, the cleft alveolus and palatal segments were reduced considerably. Also, the parts of the flattening nasals of the nose were set up.

Through interdisciplinary work, we created a new modified NAM appliance to avoid the obstacles of the traditional NAM devices and to improve the presurgical treatment by using the benefits of the postnatal period of the child to have a more effective treatment. Despite the inability of previous studies to decide on the degree of efficacy of PNAM and the fact that scientific data is limited, we consider that our research can contribute to a better understanding of why it is essential to use PNAM and of the need to enhance the apparatus. (**International Journal of Biomedicine. 2023;13(2):342-345.**)

Keywords: nasoalveolar molding • mini screw • cleft lip • cleft palate

For citation: Reshitaj A, Aliu N, Maliqaj A, Reshitaj K. Presurgical Nasoalveolar Molding Modified Technique in Complete Bilateral Cleft Lip and Palate Infant: A Case Report. International Journal of Biomedicine. 2023;13(2):342-345. doi:10.21103/Article13(2)_CR1

Abbreviations

NAM, nasoalveolar molding; PNAM, presurgical nasoalveolar molding; PSIO, presurgical infant orthopedics

Introduction

Nasal alveolar molding (NAM) is an intraoral, presurgical orthopedic device used in the first weeks of newborn babies that suffer from cleft lip and cleft palate. This device is used in this

period of growth and development of the newborn baby to use the plasticity of the nose cartilage and the formation of the early alveolar process.⁽¹⁾ The cleft lip, with or without a cleft palate as a birth defect, is a congenital orofacial anomaly that is considered among the most common and seen in children born alive.⁽²⁾

From statistics in different countries, the oral clefting rates vary from 1: 500 to 1: 2000 births.⁽³⁾ Adjunctive neonatal therapy for correcting the cleft lip and the palate is a type of presurgical infant orthopedics used since the 1950s.

Although this therapy has had some improvements in the different accesses on PSIO, and through the years has developed more after MacNeil, there have not been satisfactory results in solving the problems, especially in correcting the deformations of the nose cartilages.^(1,4) Some of the problems that the traditional approach could not address can now be solved through PNAM.

In 1993, Grayson used the principle of moldable nasal cartilage to develop the new technique and, together with his partners, described the first treatment protocol for PNAM. PNAM therapy is a technique that not only can help to correct alveoli and cleft lips, but it also can improve the configuration of the nose, lips, and cleft palate in infants. Therefore, the frequency of using this technique in the presurgical treatment of children has greatly increased.⁽¹⁾

The purpose of this study was to present a modified protocol and equipment for the treatment procedure for an infant with bilateral cleft lip and palate using PNAM techniques.

The importance of the PNAM treatment in the first postnatal weeks that it takes advantage of the optimal time immediately after the infant is born since it allows us to reduce the severity of the initial cleft deformity. Minimizing the deformities using the PNAM technique helps plan further therapy for the patient with cleft lips, especially in reducing surgical rehabilitation. In cases with bilateral clefts of the lip, alveoli, and palate, the main objective of the PNAM treatment is to repair and elongate the columella, place the premaxilla along the midsagittal plane, and pull the premaxilla gradually without pressure to approach the posterior cleft segments.⁽⁵⁾

Treatment procedures

The protocol of the presurgical treatment consists in reshaping the lip, the alveolar process, and the nostrils without surgical intervention as an essential part of the treatment for the patient with cleft lip and palate PNAM. A two-week-old boy was brought to our Department of Orthodontics. The baby was diagnosed with non-syndrome bilateral complete cleft of the primary and secondary palate (Figure 1)



Figure 1. Baby with non-syndrome bilateral complete cleft of primary and secondary palate.

After being informed of the treatment procedures, both parents were asked to fill in a form to consent. After an anamnesis with all the information, including if the infant has any concomitant disease, we made an extra- and intraoral examination, taking notes, additional and intraoral photographs, and an impression of the study model and the working model (Figure 2A).



Figure 2: A) The plaster model used to create the device; B) The device wire part that is used to activate the part of the apparatus connected to acrylic.

A special infant tray was used to create an impression of the upper dental arch with alginate. To avoid possible complications of the aspiration of the material or liquid, the infant was positioned straight and provided with high-power suction. The infant was held in a reclined position in his mother's lap in a dentistry chair. A dentistry mirror was used during the examination to move the tongue and to release the respiratory system while taking the impressions.

Construction of active alveolar molding plate

The alveolar mold plate is constructed from acrylic material. The intraoral molding plate was created on both sides of the separate segments of the maxilla and fixed with a mini screw to close the maxillary segments. The segments were projected in therapeutic planning of the modified device NAM and placement of string elements, those that are glued to the acrylic plate and also to the part that is put in the columella with the opportunity to activate them (Figure 3).

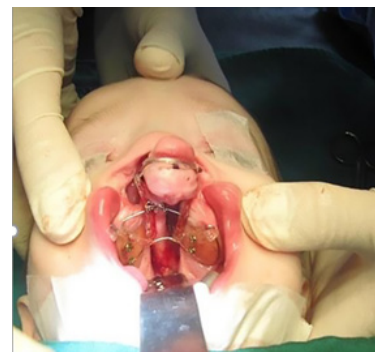


Figure 3. Fixing the device with mini-screws and connecting them with wires for activation.

Weekly visits were made based on the need to activate the strings. Later, both parts of the fabricated nasal conformers were used to keep the symmetry of the nose. Parents were

guided to place tape on the infant in the segments of the cleft lip. The acrylic plate that was mounted in maxillary segments also affects the mooring of activation of the stainless-steel string. It will also expand and help in the shaping of the nose of the infant (Figure 4). The mini screw was used after the initial close-up of the segments, and then the reduced plate of the device with accompanying active elements continued the activity. At the end of PNAM, there was a considerable reduction in the lip, alveolar and palatal cleft.



Figure 4. Baby following the placement of the modified PNAM device.

Discussion

A new approach of PNAM therapy with modified appliances is much more effective in reducing cleft deformity, and it helps in further surgical treatment. Taking into consideration three well-known techniques of NAM therapy (Grayson's technique, Figueroa's technique, and Louis's technique) and the difficult situation of bilateral cleft and palate, to improve the treatment, we used a modified NAM device, first mounted with a mini screw for the cleft palatal parts and for the creation of string elements to have an active role in closing the separate segments (Figure 2B).

The difference between the device we used and the Grayson technique is that Grayson used an orthopedic device with a wide acrylic plate that included all the parts of the palate.⁽⁶⁾ In contrast, we have reduced to the maximum the acrylic part that we used, and the difference also applies to mounting the plate. The reduced palatine plate is substituted with parts of a string with active function, where the alveoli and the cleft palate remain free, just that the cleft segments close up physiologically when light pressure is put on them. Fixation of the acrylic parts with a mini screw in the first two weeks creates stable retention of the NAM device and does not allow the device to move when the musculature is activated. Parts of the strings built earlier get active together with the nasal stent that was added to correct the nose deformity.

While the traditional Figueroa NAM asks that during the visits acrylic resin be removed from the palatal plate to shrink the segments,⁽⁷⁾ we, to reduce such a need, modified the NAM appliance by reducing parts of the acrylic plate and fixing the plate for two weeks in the cleft segments of the palatal, by also using the anchoring role of the fixed plate and activation of the string element for controlled closing up

and without the pressure of the cleft segments. A great part of the segments remains free to close up without added pressure from the plate.

In Liou's technique, the NAM plate has a reduction of the molding plate, compared to the Grayson technique, and it is made of two nasal components for forming the nose and tapes for pulling the premaxilla.⁽⁸⁾

Although the objective is the same in our case, such a technique requires strict patient monitoring. In contrast, the therapy with a modified NAM device allows control of the stability of the device in the mouth of the patient and the opportunity for adequate control of the activation of the string elements, both those that are glued to the acrylic plate and the part that is put in the columella, which enables us to achieve better effects during closing up of the segments and elongation of the columella by pulling (Figure 4).

As for keeping the nose, in our technique, we planned to use nasal conformers and place tapes. NAM also shows the ability to create the columella non-surgically by extending tissues. This is achieved by progressively extending the nasal stents and producing elastic pressures that stretch tissues next to the pro-labium. This procedure eliminates surgical repair of the columella and the resulting scar tissue from the procedure performed at the cleft palate centers.^(9,10)

Any severe form of bilateral cleft lip and palate requires presurgical care to avoid complications such as wound dehiscence or premaxilla malposition. For this aim, NAM is utilized to construct nasal cartilages, premaxilla, and alveolar ridges. But studies have identified certain limitations, among them a lack of scientific data and study, expenses, irritation of the lip and nasal tissues, threat of aspiration, mucosal ulcers, nasal and intraoral hemorrhage, fungal infection, airway blockage.^(11,12) Therefore, for this reason, the the PNAM apparatus has been modified to avoid the occurrence of these problems that may occur during the treatment of patients.

The suitable time to use NAM is from when the infant is born with CLP until he is three months old. When our patient reached this age, primary lip and nose repair was done. According to the instructions, nasal conformers must be kept for at least one year.⁽¹³⁾

Even in our case study, as a result of early intervention, we had the opportunity to use these advantages. We have also used nasal conformers to save the achieved correction with PNAM. Primary surgical closure of the lip and nose is performed from three to four months of age.⁽¹⁴⁾ NAM attempts to rectify nasal asymmetry and inadequate nasal tip projection while forcing the protruded premaxilla and enhancing the contour of the maxillary arch. NAM restores natural columellar length and avoids the need for further nose surgery.⁽¹⁵⁾ Individuals with bilateral cleft lip and nose deformity routinely undergo PNAM, primary rhinocheiloplasty, and postoperative nasal stents.⁽¹⁶⁾ Long-term, there is insufficient knowledge to support the advantage of NAM over no NAM in assessing nasal aesthetics and the shape of the alveolar arch. Long-term studies are necessary before recommending nasosulveolar shaping treatment as part of a protocol because its use is not without complications, and its true value is unproven in the long run.⁽¹⁵⁾

Conclusion

The modified NAM preoperative procedure is a better alternative for enhancing the aesthetics of the nose and the alveolar gap, as well as assisting in the approximation of the weeping segments before surgery. Despite the inability of previous studies to decide on the degree of efficacy of PNAM and the fact that scientific data is limited, we consider that our research can contribute to a better understanding of why it is essential to use PNAM and the need to enhance the apparatus.

Competing Interests

The authors declare that they have no competing interests.

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