

Case Report

A Stepwise Procedure for the Fabrication of the NAM Appliance Using Grayson's Technique

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Abstract: Rehabilitation of cleft lip and palate (CLP) patients is a challenge for all the concerned members of the cleft team, and various treatment modalities have obtained aesthetic results. Nasoalveolar molding (NAM) has gained wide acceptance and evidence in cleft therapy. Nasal moulding seems to be more beneficial and effective in unilateral cleft lip and palate patients. The principle objective of presurgical nasoalveolar molding (NAM) is to reduce the severity of the initial cleft deformity. This enables the surgeon and the patient to enjoy the benefits associated with repair of cleft deformity that is of minimal severity. For the fabrication of such appliances, an impression of the defect is necessary. Impression making in infants with cleft lip and palate is a challenging task.

Keywords: Cleft Lip and Palate, Impression Procedure, Infantile Orthopaedics, Nasoalveolar Molding

1. Introduction

Nam is orthopedics done in CLCP to move and align the separate maxillary segments, approximating the lip segments and repositioning and uprighting the septal cartilage.

Eversince its introduction by Mc Niel in 1954, many authors have used various techniques to move the maxillary segments, from simple non invasive acrylic plates to complex invasive pin retained appliances. Authors like Barry Greyson, Latham, Court Cutting, etc. have pioneered the research in this field. [1]

NAM or infantile orthopedics (IO) is a procedure which has to be ideally initiated as early as 0 to 3 months of age as it is at this age that the primary cartilage is moldable. As age advances beyond 2 months, the level of chondroitin sulphate rich proteoglycan which is responsible for increase mouldability of the growing cartilage is considerably decreased and IO becomes difficult. [2]

In unilateral cleft patients the two alveolar segments are mal aligned with the smaller cleft segment being collapsed palatally. This causes the mal alignment of the maxillary segments with gross asymmetry. Similarly, the septal cartilage is pulled towards the non cleft side causing the ala on the cleft side to be flattened and stretched. This causes an asymmetry of the nasal apertures and also decreases the nasal projection. In addition, the two lip segments stand well away from each other and any surgical intervention without NAM would cause tremendous amount of stretch on the sutured lips thus applying undue pressure on the alveolar segments. This concomitantly affects the anterior – posterior growth of the maxilla in the future. [3]

NAM aims at aligning the maxillary alveolar segments, uprighting the nasal septum, reforming the curvature of the alar cartilage and approximating the lip segments. Apart from facilitating better surgical conditions, NAM provides unrestricted maxillary growth. [4]

Thus, the procedure of NAM consists of making a series of maxillary impressions of the new born and fabricating various appliances made of a combination of soft and hard acrylic. The child is recalled every week for appliance adjustment.



Figure 1. Unilateral cleft lip and palate.

2. Procedure

1. Protocol for impression taking in CLCP infant-

As the NAM procedure is initiated as early as one week of age, various methods and precautions need to be undertaken. The mother is usually seated on the dental chair with the child on the lap in an upright position. The entire procedure is carried out in the presence of a well equipped anaesthetist as aspiration or any sort of obstruction of the respiratory passage need to be anticipated especially as most of the reflexes are still being mastered by the new born. A good high vacuum suction is of utmost importance. Four handed dentistry is almost always necessary to restrain unwanted movements of the newborns head, hands and legs. Breast feeding is advised after, rather than before, the procedure as vomiting and aspiration is of concern. [5]

2. Primary impression.

Modelling wax or impression compound is the material of choice for the primary impression. A wax sheet is softened in hot water and folded to form a double layer which is then cut approximately to the size of the child's maxillary arch. It is then resoftened, placed on the maxillary arch and adapted with finger pressure. The buccal and palatal extensions need to be checked and the wax impression need to be trimmed accordingly. Similarly, impression compound could also be used. Some authors recommend using a stainlesssteel tablespoon to carry impression compound, as a tray. Among the two materials, impression compound is the material of choice.

3. Special tray fabrication.

After making the primary model with plaster, a sheet of modeling wax is used as spacer over the entire surface.

The special tray is fabricated using clear self cure acrylic with stops and a small tray handle.

4. Final impression.

After checking the special tray for over extensions, the final

impression is made with Rubber based putty material following the standard protocol. Rubber gloves is a contraindication. Orthocal (high strength gypsum - type IV) is used to pour the impression.



Figure 2. Primary impression with compound.

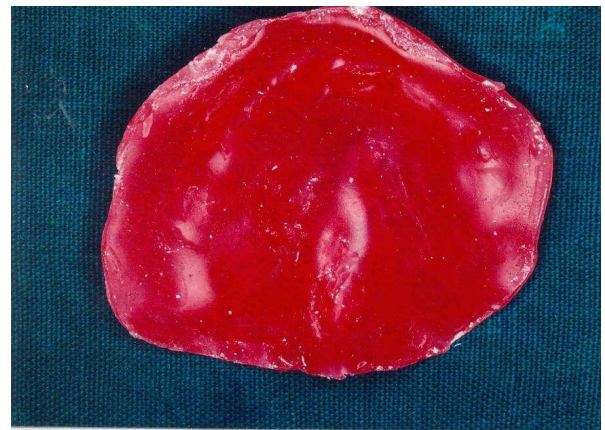


Figure 3. Primary impression with modeling wax.



Figure 4. Special tray with stopper.



Figure 5. Final impression with Putty material.



Figure 6. Appliance before loading and relieving.

5. Appliance fabrication.

The appliance is fabricated as described by Grayson⁶. It consists of a hard acrylic plate with a hole in the centre of the palate to prevent any obstructive apnea. Loading and unloading areas are marked with different colours according to the direction of movement of the segments required.



Figure 7. Black-Loading area, Pink- Relieving area.



Figure 8. Wax spacer placed on relieving areas.

Soft acrylic of 2mm thickness is placed in the loading areas and the unloading areas are relieved by trimming away the acrylic by 1 to 2mm or by placing a wax spacer. This procedure is repeated every week till the desired results are achieved. Precise addition and trimming of 2mm of acrylic is achieved by using the thickness measuring guage. In certain situations, a second appliance need to be fabricated to accommodate the growth.



Figure 9. Loading areas with soft acrylic.



Figure 10. Thickness measuring guage.



Figure 11. Soft acrylic.

An acrylic stub is attached to the anterior part of the plate in the midline which extends extra orally. Retention of the plate is achieved by (3M scotch bond adhesive tape) taping two elastics (1/4", 2.5 oz. Red, TP Orthodontics) individually which is adhered on the sides of the face, while the elastic is stretched and secured onto the stub in the midline. The parent is instructed to change the elastics regularly.



Figure 12. Appliance secured in place with taped elastics.

After a period of 1 to 2 weeks, when the patient is comfortable wearing the plate and is able to suckle without difficulty, a nasal stent is incorporated into the anterior part of the plate directly in line of the nasal aperture requiring the alar lift. The nasal stent is constructed using a 1 mm stainless wire in the form of a "swan neck", at the end of which is a bean shaped acrylic stentlined with soft acrylic superiorly. When correctly positioned in the collapsed nostril, alar blanching is observed. 2 mm of soft acrylic is added superiorly during the weekly visits.



Figure 13. Nasal stent added.



Figure 14. Appliance with nasal stent in position.



Figure 15. Pre NAM.



Figure 16. Post NAM.

Lip taping is a procedure carried out by the parent daily using micropore adhesive tape. The 2 lip segments are stretched and pulled towards each other and taped from side to side over the moustache area.

Results are achieved in approximately 3 months treatment time. Invariably, treatment is completed by this period since most surgeons prefer to carry out the primary lip repair by the end of 3 months. To add, the mouldability of the cartilage is markedly reduced by this age.

3. Discussion

The nasoalveolar moulding technique used in the treatment of cleft lip and palate deformity has several benefits¹⁴. A proper alignment of the alveolus, nose and the lip results in a better and more predictable surgical result. The cleft deformity is significantly reduced in size with the NAM therapy before surgery, facilitating easier primary repair of the lip, alveolus and the nose. The approximation of the alveolar processes before surgery also enables the surgeon to perform successfully gingivoperiosteoplasty. Lee et al. demonstrated that midfacial growth in the sagittal and vertical plane was not affected by NAM and gingivoperiosteoplasty. Studies show that the change in the nasal shape is stable with less scar tissue. There is also better lip and nasal form. This reduces further surgical revisions. The permanent teeth also have a better chance of eruption in a good position with adequate periodontal support. Studies have also demonstrated that 60% of patients who underwent NAM and gingivoperiosteoplasty did not require secondary bone grafting. The remaining 40% who did need bone grafts showed more bone remaining in the graft site compared to patients who have had no gingivoperiosteoplasty. With proper training and clinical skills, NAM has demonstrated tremendous benefit to the cleft patients as well as to the surgeon performing the primary repair.

4. Conclusion

It is one of the most popular and feasible impression technique used clinically for the prosthetic management of cleft lip and palate in infants. The appliance fabricated needs

to be reviewed on a weekly basis to make the necessary adjustments. Nasoalveolar moulding is done primarily, to align the maxillary segments, approximate the lips and upright the nasal septum. This helps the surgeon achieve a better surgical result. The cleft deformity is significantly reduced in size with the NAM therapy before surgery. This results in an easier surgical procedure with more predictable results. Long term studies have also revealed that the nose and lip shape is more stable with less scar tissue formation. With proper training and clinical skills, NAM has demonstrated tremendous benefits to the patient as well as the surgeon.

As we are dealing with infants, this technique comes accompanied by certain limitations. The clinician is hampered by the necessity to obtain the consent of the parents, an uncooperative patient and a small working field. Studies are on to find easier approaches to impression making in infants and better techniques to fabricate the appliance.

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