NASO ALVEOLAR MOLDING BY TRADITIONAL GRAYSON'S TECHNIQUE AND A MODIFIED TECHNIQUE INVOLVING REDUCED PATIENT VISITS-TWO CASE REPORTS.

Abstract: Cleft lip and cleft palate are the congenital deformities with an incidence of about one in 500-700 births. Management of the cleft lip and palate involves a multi-disciplinary team, which includes the Paediatrician, Pedodontist, Orthodontist, Cranio-Facial and Plastic Surgeon, Speech Therapist. The primary intervention in the management of cleft lip and palate is done by the Pedodontist, which is the presurgical Naso alveolar moulding- as the name indicates the procedure is done to reduce the deformity and moulds the deformed nasal cartilage and alveolus of the infant, by using a moulding oral plate with a nasal stent to reduce the alveolar cleft gap and also bring the nasal deformity to a more suitable alignment before the primary lip closure by plastic surgeons. It also helps in improving nutrition by preventing nasal regurgitation. Here are the two case reports of the two infants who presented with the complete unilateral cleft lip and palate, in which we adopted a traditional Grayson's technique and a modified technique as advocated by the Nitte Meenakshi Institute of Craniofacial Surgery, Nitte University. Both the techniques have shown a desirable lessening of the alveolar cleft gap and a more normal morphological alignment of deformed nostril where the width of the deformed nasal dome has decreased, and the height of the nasal dome has increased at the end 3 months. However, the advantage of the modified technique promoted by Nitte Craniofacial institute is that it lifts the burden of weekly visits to the hospital or Cleft Centre, as is recommended by Grayson's protocol. Instead a follow up visit after every two weeks or three weeks is sufficient. Hence, pre surgical Naso Alveolar Moulding is a crucial in patients with cleft lip and palate which decreases the deformity, reduces post-surgical scarring, cuts off future scar reduction surgeries, gingivoperiosteoplasy. Longitudinal studies with larger sample sizes are required to establish whether the modified technique of Naso alveolar moulding advocated by Nitte Meenakshi Craniofacial Institute can be practised as it reduces the number of follow-up patient visits and chair-side time.

Key words: Cleft Lip and Cleft Palate, Naso Alveolar Moulding, Grayson's Technique, Modified technique by Nitte University.

INTRODUCTION

Cleft lip and/or palate (CL/P) is one of the most prevalent congenital craniofacial birth abnormalities in the head-and-neck regions. The World Health Organization (WHO) estimates that one in 500–700 people are born with this condition, and that number varies greatly between geographic locations.1the nasal deformities associated with unilateral cleft lip and palate is: deviation of the nasal septum towards the non-cleft side, depressed, flattened nasal dome on the cleft side due to disruption of the lower lateral alar cartilage, widened , flared , and inferiorly displaced alar base on the cleft side, short columella displaced towards the non-cleft side, reduced nostril height / vertical dimension on the cleft side

Nasal deformity becomes more distorted with the time if no surgical mediation is undertaken.[1]. Secondary surgical revision of the nasal deformity would lead to more surgical interventions and more scarring and less than ideal results [2]. Thus, any form of the nonsurgical treatment to reduce the nasal deformity early in the life is highly desirable. There have been attempts in the experimental animal models to reverse this deformation by in utero nasal moulding [3]. The increased plasticity of the immature infant cartilage is due to a raised circulating maternal oestrogen leading to elevated levels of hyaluronic acid which renders the cartilage soft, pliable and more mouldable due to its plasticity. It is best utilized with in the first 6 weeks of the birth [5]. First attempt at the presurgical nasal correction was

made by Matsuo et al. [5, 6]. Grayson [7] conceptualized the combination of the presurgical nasal moulding with the conventional form of the presurgical orthopaedics.

The primary goal of PNAM is to reduce soft-tissue and cartilaginous cleft deformities, thereby minimizing scar formation and creating favourable conditions for surgical correction of the soft-tissue defect. PNAM helps guide growth, allowing improved repositioning of the alveolar segments and nasal structures. It also supports feeding, enhances facial aesthetics, and may provide psychological benefits.

Despite its effectiveness, the traditional Grayson technique requires weekly adjustments and follow-up visits to the cleft centre for approximately 3–4 months. For families living far from the treatment centre, this schedule can create considerable financial and practical difficulties. Caregivers may need to travel long distances and lose a day's wages each week, which is especially challenging for those employed as daily-wage workers in the unorganised sector. This concern was frequently reported by parents attending our cleft centre at a tertiary hospital in West Bengal. To reduce this burden, we adopted the modification described by Ajay Bajaj et al.[8], which permits appliance adjustments at intervals of two to three weeks while still achieving the intended correction. This case report describes two infants treated with the traditional and modified approaches and compares their outcomes using clinical photographs of the nasolabial region and dental casts.

CASE REPORT 1: A 1-month-15-day-old male infant presented to the Department of Pedodontics with cleft lip and palate. The child was born at term by caesarean delivery, with a birth weight of 3 kg. There was no history of consanguineous marriage, oro-facial clefts in the family, or maternal illness during pregnancy. Clinical examination revealed a right-sided cleft lip extending into the alveolus, hard palate, and soft palate, consistent with Veau group III cleft lip and palate (Figures 1.1and 1.2). Presurgical nasoalveolar moulding was planned as part of the initial treatment, with the aim of reducing the cleft gap and improving tissue approximation before surgical repair.

Figure 1.1:Cleft involving right side of the lip extending to alveolus hard and soft palate

Figure1.2: Cleft involving right side of the upper lip

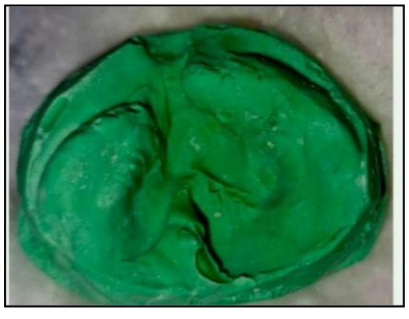

Figure 1.3: pre- operative cast

Figure 1.4: oral plate delivered

Figure 1.5: oral plate with nasal stent,

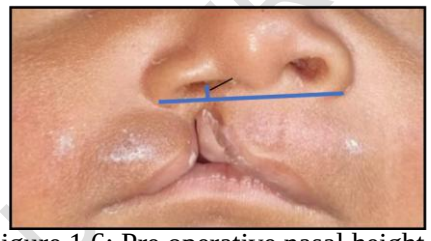

Figure 1.6: Pre operative nasal height

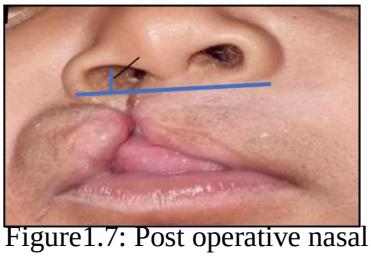

Figure1.7: Post operative nasal height

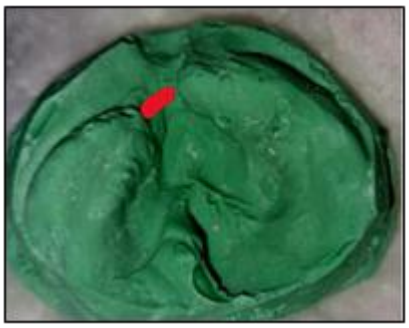

Figure 1.8: preopearative alveolar cleft gap

Figure1.9: Post operative cleft gap

Figure 1.10: post surgical image

At the first appointment, initial lip taping was done using a 3M micropore tape and dynoplast. A one-fourth inch width of dynoplast is taken, the tapping done from the unaffected side to affected side with a pressure just enough to approximate the two parts of the lip which are separate due to cleft.

A primary impression was made with modelling wax, followed by preparation of the primary cast and fabrication of a custom tray. At the second the labial aspect of the greater alveolar segment. 1-mm relief was created by trimming the acrylic on the labial aspect of the lesser alveolar segment and the palatal aspect of the greater alveolar segment. This was intended to promote alveolar moulding through bone resorption in the areas covered by the soft liner and bone deposition in the relieved areas. For retention, an acrylic handle measuring 15 mm in length was fabricated, with its terminal end shaped appointment, a secondary impression was made using an elastomeric impression material, addition silicone. The master cast was then prepared. It was used to fabricate the oral moulding plate A soft liner was added to the palatal aspect of the lesser alveolar segment and into a bulb to engage the elastics.

The oral plate was delivered with lip taping in place (Figure 1.3). After one month, the cleft gap had decreased from 10 mm to 4 mm. A nasal stent was then fabricated from 21-gauge stainless-steel wire in a swan-neck configuration. An acrylic bulb was added to the stent and covered with a soft liner to prevent mucosal irritation (Figure 4). The stent elevated the depressed nasal ala on the cleft side and helped mould and reshape the nasal ala and nostril. One month after stent placement, marked elevation of the nasal ala and improved nostril form were observed (Figures1. 6 and 1.7). After two months of treatment with the NAM plate and nasal stent, a follow-up impression was made for comparison. The alveolar cleft had noticeably reduced, and the use of soft-liner additions with selective acrylic relief on opposing alveolar segments promoted moulding of the lesser and greater segments through bone

deposition and resorption. This produced labial movement of the lesser segment, palatal movement of the greater segment, and formation of a U-shaped arch. Improved nutrition was reflected by an increase in body weight from 3 kg to 6 kg. The patient was then referred to the medical hospital for primary lip repair, and the postoperative result is shown in Figure 1.10.

Case report 2:

A 15-day-old female neonate with unilateral cleft involving the right side, visited the hospital presented to our department with a facial cleft. She was born at term by vaginal delivery and weighed 2.5 kg at birth. There was no family history of cleft lip or palate, maternal alcohol use, smoking, or significant medical illness. Clinical examination revealed a right-sided cleft lip and Cleft palate with deformity of the right nasal ala (Figures 2.1 and 2.2). Lip taping was initiated at the first appointment (Figure 2.3). A wax impression was made, followed by fabrication of a custom tray. The final impression was recorded using heavy-body addition silicone. During the procedure, the infant was held prone in the mother's lap with the neck extended to provide adequate access and visibility. The head was carefully supported, and the posterior extent of the tray was directly visualized. The impression material was controlled to prevent overflow beyond the tray borders. The infant was monitored throughout the procedure and kept actively crying, which helped maintain airway patency and allowed direct visualization of the cleft. All undercuts and the cleft space were blocked out with plasticine, giving the cast the appearance of an intact alveolus. Layers of plasticine was also added as a spacer in the region where the major segment was expected to move palatally during treatment (Figure 2.4). Blocking out the cleft space and adding the spacer formed the crucial modification, eliminating the need for weekly trimming of the appliance as required in Grayson's protocol. The borders of the plate were carefully smoothed, and adequate relief was provided around the labial frenum attachments. The retention arm measured 15 mm in length and 5 mm in diameter and was angulated at 30° to the occlusal. A soft liner of 2mm thickness was added to the labial aspect of the greater alveolar segment. A nasal stent was fabricated from 21-gauge round stainless-steel wire as an extension from the labial flange of the NAM plate. Its free end extended into the nostril to support the deformed nasal cartilage. The NAM plate with the nasal stent was subsequently delivered (Figure 2.5). Unlike Grayson's technique nasal stent was incorporated with the oral plate at the onset of appliance therapy and we did not wait for cleft gap to reduce by 5mm to add nasal stent. This will utilize the early elasticity of the appliance. After two adjustments wherein the greater segment was modified by adding soft relining resin to the buccal aspect of the greater segment at an interval of three weeks, there was a reduction in cleft gap from 12 mm to 5 mm (Figure 2.6and figure 2.7) and the child was referred for primary lip repair. We can also notice that the deviation of the

and nasal aperture height has improved in Figure 2.8 and 2.9. The postoperative result after primary lip surgery is shown in Figure 2.12.

Fig2.1: deformity of right nasal ala

Fig 2.2: deformity of the alveolus and palate

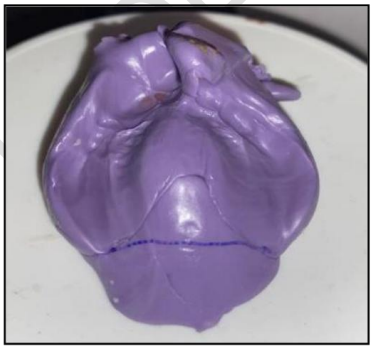

Figure 2.3: Impression by condensation sillicone

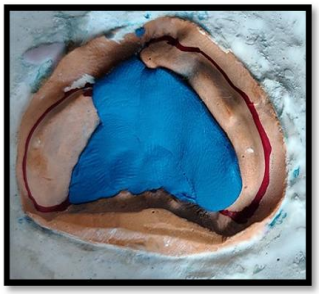

Figure 2.4: the blocked out cast

Figure 2.5: the appliance delivered

Figure 2.6: the alveolar cleft gap of 11mm

Figure 2.7: alveolar cleft gap reduced to 5mm

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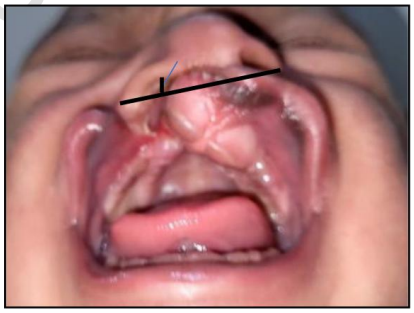

Figure 2.8:

Figure 2.9

Figure 2.10 Figure 2.11

FIGURE 2.8 to 2.11- shows the pre-operative and post operative changes before and after changes of PNAM.

Figure 2.8, 2.9 shows the nasal height- pre-operative (vertical black line), shows the nasal height- post-operative (vertical black line) respectively.

Figure 2.10, 2.11 shows the nasal base has become more horizontal with respect to intercanthal line and the deviation of columella has improved

Figure 2.12: post operative result

DISCUSSION:

Since its introduction in the 1950s, the use of presurgical orthopedics in cleft lip and palate cases has generated controversy. But critics of the presurgical therapy have characterized

it as an expensive, time-consuming, and unnecessary process.[6] When treating cleft lip and palate deformities, the nasoalveolar molding technique offers a number of advantages. An improved and more reliable surgical outcome is possible when the alveolus, lip, and nose are properly aligned. NAM therapy greatly reduces the amount of the cleft deformity prior to surgery, which makes primary repair of the lip, alveolus, and nose simple.[7]

The conventional Grayson's technique of PNAM involved usage of Nasal stent only after the alveolar cleft gap reduced to 0.5 cm or less. On the other hand Modified Figueroa technique involved adding nasal stent to the intra oral molding plate on the first appointment itself. The rationale behind this was to use the plasticity of the nasal cartilage as early as possible. Koya et al[5] made some further alterations from the original design which included addition of U loop to the nasal stent which helped in retention of plate as well as adjustment of the stent.[5] The innovation done by Bajaj et al in which spacer was applied on the palatal side of the greater segment was adopted in the second case. This made the treatment less laborious as it avoided the selective trimming of the molding plate and also the patient did not need to visit to the ckeft centre after every week. Only an appointment after every three weeks might be sufficient.[6]

The association of feeding problems in cleft patients has been widely documented. Wilcox et al.[8] demonstrated the link between malnutrition and mortality in underdeveloped nations. Pandya and Boorman[9] reported that infants in wealthy nations with cleft palates did not flourish. The Craniofacial/Lactation Infant Feeding (CLIF) clinic addressed the feeding problems of the patients and formed a feeding team consisting of a nutritionist, a feeding specialist (either occupational or speech therapy), and a lactation counselor.[10]

Pan-Yun Chou et al[11] did a rare study of using 3D images to determine the progression of PNAM treatment in patients of unilateral cleft lip and palate. In this study, the mean cleft lip area was 100.4±22.7 mm^2 before treatment, which dropped to 48.8±13.4 mm2 after stage 1 was finished and 42.4±11.3 mm^2 at the end (10th week) of treatment.

PNAM, however, can cause some complications. The most frequent ones are intraoral tissue ulcers and inflammation of the gingival or oral mucosa. The child needs to be examined at every appointment, and any regions where the molding plate is applying too much pressure need to be appropriately relieved. The plate can drop down and block the airway. A 5 mm diameter hole should be drilled in such cases to prevent airway blockage. [12]

The Indian sub-continent remains one of the most populous areas of the world with an estimated population of 1.1 billion in India alone. This yields an estimated 24.5 million births per year and the birth prevalence of clefts is somewhere between 27,000 and 33,000 clefts per year. Inequalities exist, both in access to and quality of cleft care with distinct differences in urban versus rural access and over the years the accumulation of unrepaired clefts of the lip and palate make this a significant health care problem in India. In recent years the situation has been significantly improved through the intervention of Non Governmental Organisations such as SmileTrain and Transforming Faces Worldwide participating in primary surgical repair programmes.[13]

Conclusion:

Pre surgical naso-alveolar molding is a first and crucial step in multidiscipilinary management of the cleft lip, alveolus and palate, in case report 1, we used conventional grayson's technique and case report 2 we opted--------- technique for molding the alveolus, reducing the cleft space, elevation of nasal ala. Both techniques have shown a significant molding of alveolus, nose, reduced the cleft space. which acted as helping hand for the surgeon for the primary lip surgery

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