International Journal of Otorhinolaryngology and Head and Neck Surgery
Thapa A et al. Int J Otorhinolaryngol Head Neck Surg. 2024 Oct;10(5):558-561
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

DOI: https://dx.doi.org/10.18203/issn.2454-5929.ijohns20242651

Case Report

Early functional restoration in cleft patients by presurgical infantile orthopedics with follow up

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Received: 23 July 2024
Revised: 14 August 2024
Accepted: 30 August 2024

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ABSTRACT

Cleft lip and palate present significant surgical challenges, particularly in cases of extensive clefts associated with severe nasolabial deformities. This case series focuses on the role of presurgical naso alveolar molding (PNAM) in improving surgical outcomes by reducing cleft deformities and enhancing facial symmetry. PNAM, combined with nasal stenting and presurgical orthopedics, aids in aligning the segments of the alveolar cleft and correcting nasal cartilage asymmetry. The study involved bilateral and unilateral cleft repairs, utilizing the Randall's modification of tennison triangular flap for unilateral cases and the Millard-Mulliken procedure for bilateral full clefts. Precise preoperative marking, meticulous tissue rearrangement, and multi-layer closure were key to achieving optimal results. Postoperative care included close monitoring, with skin sutures removed on the fifth day. The results align with existing literature, demonstrating the effectiveness of PNAM in narrowing the cleft and achieving nasal symmetry. This case series highlights the importance of early intervention and the application of PNAM plates in the comprehensive treatment of cleft lip and palate, contributing to favorable outcomes in reconstructive surgery.

Keywords: Presurgical nasoalveolar molding, Cleft lip, Presurgical infantile orthopedics

INTRODUCTION

Wider extensive clefts are associated with severe nasolabial deformities, presenting a significant surgical challenge to achieve a functional and aesthetic outcome were cleft palate, the nasal septum deviates to the noncleft side. The maxillary structure of the cleft lip and palate is divided into two or three segments by the cleft of the palate and alveolus which causes growth and many functional disturbances. Presurgical nasoalveolar molding (PNAM) aims to reduce cartilaginous cleft deformity and soft tissue deformity in order to limit scar formation and enable optimal soft tissue restoration after surgery.[1,2] The present case report focuses on two cases which were dealt in the Department of Dental Surgery and Oral Health Sciences.

CASE REPORTS

A newly born boy presented with unilateral cleft lip and palate on the left side. Extra oral features included flattened nasal dome on the left side, deviation of the columella to the right side, a groove that extended to the base of the columellar sulcus on the left side, and a gap that measured about 10 mm above the top lip (Figure 1A).

Case 1

Treatment objectives and plan

Treatment goals formulated to achieve the optimum esthetics and function. The treatment plan was systematized into three phases as under, PNAM followed

by nasal stent in later stage. Lip closure (to be done at the age of 3 months). Palate closure (to be done at the age of 15-18 months).

Figure 1: (A) Frontal photograph (B) Nasoalveolar molding therapy (C) After nasoalveolar molding (D) After surgery.

Treatment progress

In accordance with the American Cleft Lip and Palate Association's (ACPA) recommendations, a heavy-bodied impression medium was the medium employed for the initial impression. The presurgical nasoalveolar molding (PNAM) molding plate was made from methyl methacrylate with a thin layer of soft denture material placed inside. The device was attached extra orally, or outside the mouth, to the cheeks using surgical tapes that included orthodontic elastic bands on one end (Figure 1B). The tissue surface of the appliance was modified to begin the moulding of the greater and lesser alveolar segments on either side of the cleft by selective removal of acrylic material from the region where bony molding was desired. After 8 weeks of active nasoalveolar moulding, an alveolar width reduction of 2.5 mm was achieved, after which the nasal stent was added to the labial flange of the moulding plate for nasal cartilage moulding (Figure 1C). Pictorial evaluation reveals an improvement in the vertical level of nasal alae. Discrepancy in the vertical level of both sides of alae, which was 3 mm differential reduced to 1mm prior to surgery, reduced by 2 mm before surgery, and reached 0 mm after 1 month of surgery (Figure 1D). Nasal tip deviation from the midsagittal reference plane reduced from 4 to 1.5 mm prior to surgery and became nil after surgery. The height of the ala of the nose showed an improvement of 5 mm on the affected side from 3mm before nasoalveolar moulding, ensuring symmetrical nasal morphology (Table 1).

Measurements of these records were done 3 times during the first 4 months of treatment, which revealed a gradual cleft reduction amounting to 10 mm in the alveolus and 2 mm in the palatal segments.[3]

Table 1. Photographic analysis in different time interval.

	Case 1			Case 2		
	Phase 1	**Phase 2**	**Phase 3**	**Phase 1**	**Phase 2**	**Phase 3**
Alar height						
Right	6 mm	6 mm	4 mm	2.5 mm	4 mm	5 mm
Left	3 mm	5 mm	4 mm	2.5 mm	4 mm	5 mm
Alar width						
Right	5 mm	6 mm	6 mm	9 mm	7 mm	5 mm
Left	8 mm	7 mm	6 mm	9 mm	7 mm	5 mm
Deviation of nasal tip from facial midline	4 mm	1.5 mm	0 mm	0 mm	0 mm	0 mm
Intersegmental cleft distance	10 mm	2 mm	0 mm	0 mm	0 mm	0 mm

Phase 1=Pretreatment, Phase 2=Presurgical, Phase 3=Post treatment

Case 2

A 2 months newly born boy with bilateral cleft lip and palate with complaint of nasal regurgitation fluids. Associated findings were bilateral microtia and congenital heart defect. Extra orally patient had a bilateral cleft of the upper lip which was extended up to the respective columellar sulcus with a depressed deformed and flattened nasal base along with protruded premaxilla, small prolabium and short columella (Figure 2A). Intraorally cleft was complete from alveolus to soft and uvula.

Treatment objective

Further, centralization and retraction of the protruding premaxillary segment were advocated in bilateral cleft lip and palate cases to improved lip function, enhanced palate morphology, facilitation of feeding, optimizing surgical outcomes.

Treatment procedure

Standardized impression techniques and nasoalveolar moulding techniques were followed as mentioned in case 1. Once, the alveolar segments were in alignment and the gap reduced to less than 5 mm patient was subjected to lip repair surgery. Improvement in the displaced columella achieved after nasoalveolar moulding bilaterally. The discrepancy of the cleft region was 10mm which got reduced to 7 mm before surgery after NAM therapy and further by 0 mm after 1 month of surgery. Nasal tip deviation and displaced columella from the midsagittal reference plane were reduced. Gradual cleft reduction to 6 mm has been achieved which gradually obliterated after surgical lip repair (Figure 2B, 3C and 3D).[3] The patient was recalled after 11 years for further comprehensive orthodontic management. Comparative extraoral images between post-treatment and 11-year follow-up reveals stable results (Figure 3 and Table 1).

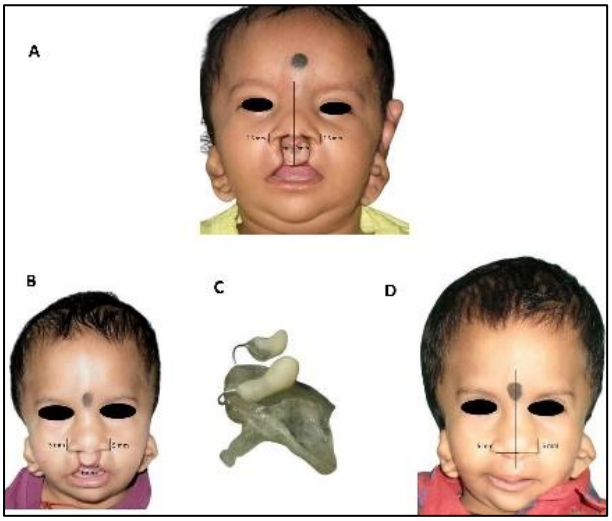

Figure 2: (A) Pretreatment photographs (B) NAM (C) Nasal stent (D) Lip repair.

Figure 3: Frontal photograph after 11 years.

Figure 4: Surgical lip repair of unilateral cleft lip and palate patient.

DISCUSSION

Current advancements in the rehabilitation of cleft lip and palate have focused on preoperative orthopaedic treatment to improve surgical outcomes. The use of nasal stenting, presurgical orthopaedics, and PNAM has all attempted to improve facial symmetry before surgery.[4,5] Aligning the segments of the alveolar cleft and addressing the asymmetry of the nasal cartilage and soft tissues are the objectives of PNAM. Once the patient reached a minimum age of 10 weeks, a minimum weight of 10 pounds, and a blood haemoglobin level of more than 10 gm%, we performed both bilateral and unilateral cleft repairs under general anaesthesia.

Our institution uses Randall's modification of tennison triangular flap procedure for repairing unilateral cleft lip.[6] We treated intermediate cleft lips by rearranging the tissue as needed. The goal of unilateral cleft repairs is to accurately identify the cupid's peak on the unaffected side of the lip, as well as on the medial and lateral segments of the cleft. The objective was to lower the vertically abbreviated medial section in order to align its "cupid's peak" position with the "cupid's peak" on the unaffected side.

The initial stage involved precisely delineating the cupid's peak on the unaffected side, as well as on the medial and lateral segments of the cleft side of the lip, using meticulous skin marking that involved correct measurements of distances and angles. We further verified the 'back cut' and the 'drop'. We made cuts on the skin and subcutaneous tissue following the indicated lines. We separated the anomalous connection of the orbicularis oris, and then mobilized the muscle to increase its length. We arranged the tissues in a straight line and performed the closure process in multiple layers.

We used the Millard-Mulliken procedure for all bilateral full clefts.[7] The first step involved drawing the midline of the columellar base. We measured the height of the

philtral column on both sides of the midline marker and found the midline of the prolabium where the skin met the vermilion border. Next, we delineated a symmetric 5mm philtrum by placing symmetrical points 2.5 mm apart from the midline marking. Next, designate both the alar base and Noordhoff's point on each side. Now make a cut starting at Noordhoff's point and extending 2.5 mm to the side, or half the breadth of the intended philtrum.

Marking a point medially from the last point at a distance equal to the height of the proposed philtrum determined its height. We designated points at the same distance as the markings from the columellar base to the nasal sill point, with a focus on the cleft. We then identified the incisions and released the anomalous muscle connection. Both approaches involved the separate closure of the oral mucosa, lips, and muscles using 3-0 polyglactin (VICRYL™ Ethicon, Somerville, New Jersey). The skin was closed with 5-0 Nylon (ETHILON™ Ethicon, Somerville, New Jersey). Following the surgery, the paediatric ward monitored the children under a sterile surgical bandage. They were released to their residence the following day. The skin sutures were extracted on the fifth day, after which reinforced adhesive skin dressings (3M™ Steri-Strip™, 3M India limited) were applied for a duration of one week.

Literature reported that the cleft narrowed by 0.5 mm after a month's treatment, while Pai et al. observed a reduction of 5.8 mm after 3-4 months of treatment3,4,8. The results of the present case series are in concordance with these studies. A study demonstrated the effectiveness of PSIO, particularly nasoalveolar Molding (NAM), help in achieving nasal symmetry bilaterally and facilitating plastic and reconstructive surgeon during primary cleft lip repair.[2] Grayson and Shetye conducted research that underscored the utility of NAM in achieving favourable outcomes in cleft lip and palate patients, emphasizing the importance of early intervention.[9,10]

CONCLUSION

The case series offered here showcases important insights into the effective application of PNAM plates in comprehensive treatment of patients with cleft lip and palate with reconstructive surgeon for optimum results.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

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Cite this article as: Thapa A, Kadu A, Ray S, Walia BS, Antil A, Kumar AN. Early functional restoration in cleft patients by presurgical infantile orthopedics with follow up. Int J Otorhinolaryngol Head Neck Surg 2024;10:558-61.