THE COMPARSION OF CHANGES IN NASAL SYMMETRY BEFORE AND AFTER NASOALVEOLAR MOLDING (NAM)

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ABSTRACT:

Introduction: Presurgical Nasoalveolar molding is effectively used as an adjunctive procedure to improve nasal symmetry in patients with unilateral and bilateral cleft lip and palate. The increasese in nasal symmetry is by decreasing columellar deviation, increasing nostril height on the affected side, maintaining bialar width of nose, and creating more symmetrical nostril heights and widths. The improvement was correlated with the time the appliance was applied. **Objectives:** To assess the change in nasal symmetry following presurgical nasoalveolar molding. **Material and Method:** Total number of subject were 50 Infants with cleft lip and palate came to Department of Orthodontics, Karachi Medical and Dental College Hospital [KMDC] with exclusion of any other craniofacial malformations or systemic diseases and previously surgically treated cases. Duration of this study set at six months. **Data Analysis:** Statistical analyses were performed using SPSS 16.0 with paired t test to compare the differences. **Results:** There was a statistically significant increase in the nostril height $P < 0.01$ and a statistically significant decrease in the nostril width and width of the alveolar cleft $P < 0.01$ shown by paired t test.

Key words: Cleft Lip & Palate, Pre-surgical Nasoalveolar Molding (NAM), Nasal Symmetry

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INTRODUCTION:

Clefts of the lip and/or palate (CL/P) are among the most common birth defects worldwide[1].It is the second most common congenital malformation of the entire body, trailing only clubfoot in incidence[2]. These are caused by the failure of fusion between the medial nasal process and the maxillary process, or between the palatal processes. These failures are the result of genetic and environmental factors.

The frequency of clefting is higher in Asian people than other races[3]. They can be separated into two different phenotypes: cleft lip with or without cleft palate; and cleft palate only. However, Orofacial clefts can be further classified as nonsyndromic (isolated) or syndromic based on the presence of other anomalies. Approximately 30% of cleft lip and palate and 50% of cleft lip's patient only have one of more than 400 described syndromes[4-7].

The management of oral clefts is very important and sensitive, great advances have been made in the last 30 years in treatment, but multiple surgical procedures and a lifetime of clinic visits are still required, leading to emotional and physical stress for the patient and their families[8]. Most children born with a unilateral cleft develop a deviated nose, which often is a focus for teasing in adolescence. Rhinoseptoplasty to resolve the deviation can not be performed before cessation of growth of the internal and external nose. For this a promising treatment is a nasal stent on a feeding plate. Presurgical Nasoalveolar molding is effectively used as an adjunctive procedure to improve nasal symmetry in patients with unilateral and bilateral cleft lip and palate. The increasese in nasal symmetry is by decreasing columellar deviation, increasing nostril height on the affected side, maintaining bialar width of nose, increasing columellar width, and creating more symmetrical nostril heights and widths.

MATERIALS AND METHODS:

The study population comprised 50 patients (24 female and 26 males).The records of cleft lip and palate (unilateral or bilateral cleft lip/palate) patients aged between birth to 3 month-old infants, who had visited to Karachi Medical and Dental College were

taken. Other craniofacial malformations, systemic diseases e.g. Treacher-Collins malformation and previously surgically treated were set under the exclusion criteria.

DATA COLLECTION: Data was collected from patients coming to the department of Orthodontics, Karachi Medical and Dental College Hospital, referred by gynaecologists, pediatricians and plastic surgeons. As the prevalence of cleft patients is very low[1] (P=3.6 / 1000) by using formula minimum sample size is 3, but KMDC is the largest public setup, so sample size was increased to 50 cases. After taking consent from the patient's parents, history was taken and clinical examination done. The initial nasal length, nasal width, nostril width, nostril height and nasal dome height T_1 were directly measured intra-orally using a Boley gauge with 0.1mm precision. This procedure was repeated after nasoalveolar molding was completed and measurements were taken T_2. All measurements were taken by the same observer, under the supervision of the same orthodontist, with the same Boley gauge. An impression of the infant's maxilla is taken in the orthodontic clinic using special infant trays with heavy-bodied silicone impression material as soon after birth as possible. Two casts are poured from the impression using dental stone plaster. The region of the alveolar cleft on the construction cast is filled with wax, and an infant orthopedic plate is constructed using autopolymerizing acrylic resin lined with a thin layer of soft denture material. The plate thus does not engage any undercuts of the palatal shelves.The appliance was secured extra-orally to the cheeks bilaterally by surgical tapes, which had an orthodontic elastic band at one end. The elastics looped over a retentive arm extending from the anterior flange of the plate. The retentive arm was positioned approximately 40^{o} down from the horizontal to achieve proper activation and to prevent unseating of the appliance from the palate. Tapes were also applied at the base of the nose [nasolabial angle] and not low on the lip near the vermilion border to approximate the cleft lip segments. Lip taping was done using surgical tapes and Mastisol (adhesive dressings). This gives the effect of a simulated nonsurgical lip adhesion. The plate is maintained in position in the mouth of the infant 24 hours a day and is removed only for cleaning after feeding.

A0.032-inch stainless steel wire is incorporated into the plate and custom bent in situ to form a nasal stent. In the weekly visits, soft denture reliner is added incrementally to the nasal stent, and the wire is adjusted to gently lift the alar dome cartilage and slowly mold the depressed and concave lower lateral cartilage on the cleft side. Parents or care providers are also instructed to apply a thin coating of lubricant on the nasal stent and under the cleft nostril prior to insertion. The reciprocal force from the nasal stent acts on the anterior part of the alveolus and helps to mold the free end of the greater segment to approximate the edges of the alveolar segments more effectively. Through the gradual addition of soft reline to the nasal stent and activation of the nasal prong, the shape of the cartilaginous septum, alar tip, and medial and lateral crus are carefully molded to resemble the normal shape of these structures. Following this approach, nasal molding is continued over a period of 8 to 10 weeks. Primary lip repair is routinely done between 3 and 5 months of age.

DATA ANALYSIS:
Statistical analysis was performed with statistical software SPSS 16.0. All numeric response variables were presented by mean ± standard deviation [SD]. Paired t test was applied to compare means of pretreatment and post treatment nasal length, nasal width, nostril width, nostril height and nasal dome height.

Table -1: Paired Samples Correlations

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	nl1 & nl2	50	.780	.000
Pair 2	nw1 & nw2	50	.765	.000
Pair 3	rnw1 & rnw2	50	.867	.000
Pair 4	lnw1 & lnw2	50	.690	.000
Pair 5	rnh1 & rnh2	50	.684	.000
Pair 6	lnh1 & lnh2	50	.209	.145
Pair 7	rndh1 & rndh2	50	.640	.000
Pair 8	lndh1 & lndh2	50	.202	.160

Table-2: Paired Samples Statistics

Paired Samples Statistics

		Mean	Std. Deviation	Std. Error Mean
Pair 1	nl1	22.8000	3.76883	.53299
	nl2	26.5200	3.11835	.44100
Pair 2	nw1	29.5300	2.98706	.42243
	nw2	27.2800	2.94882	.41703
Pair 3	rnw1	11.8300	5.44791	.77045
	rnw2	10.1000	3.94477	.55787
Pair 4	lnw1	14.2800	3.91382	.55350
	lnw2	10.8200	2.85493	.40375
Pair 5	rnh1	1.7500	1.62960	.23046
	rnh2	4.1300	1.38435	.19578
Pair 6	lnh1	1.1100	1.09400	.15472
	lnh2	4.1100	1.21760	.17219
Pair 7	rndh1	3.6300	2.12807	.30095
	rndh2	6.3000	1.16934	.16537
Pair 8	lndh1	2.6400	1.69645	.23991
	lndh2	6.2800	.85213	.12051

RESULTS:

Total number of patients underwent presurgical nasoalveolar molding was Fifty, among them 25 were unilateral and 25 were case of bilateral cleft lip and palate, out of these 26 were males and 24 were females.

The nasal length (pre treatment 22.8000 mm (SD 3.76883); post molding 26.5200 mm (SD 3.11835) showed an increase of -3.7200, (SD 2.36505). which was calculated as very highly significant (P<0.0.01) at 2-tailed significance level.(table 1, table 2, table 3)

The Nasal width (pre treatment 29.5300 mm SD 2.98706 ; post molding 27.2800 mm SD 2.94882) showed a decrease of 2.2500 (SD 2.03603.) which was calculated as very highly significant (P<0.0.01) at 2-tailed significance level. (table 1, table 2, table 3)

The Nostril width on right side (pre treatment 11.8300 mm SD 5.44791; post molding 10.1000 mm SD 3.94477) showed a decrease of 1.7300 (SD 2.82158) which was calculated as very highly significant (P<0.0.01) at 2-tailed significance level. (table 1 , table 2 , table 3).

While the nostril width on left side (pre treatment 14.2800 mm SD 3.91382 ; post molding 10.8200 mm SD 2.85493) showed a decrease of 3.4600 (SD 2.83894) which was calculated as very highly significant (P<0.0.01) at 2-tailed significance level. (table 1 , table 2 , table 3)

The Nostril height on right side (pre treatment 1.7500 mm (SD1.62960); post molding 4.1300mm (SD 1.38435) showed an increase of –2.38 (SD 1.21873) which was calculated as very highly significant (P<0.0.01) at 2-tailed significance level. (table 1 , table 2 , table 3)

While the Nostril height on left side pre treatment 1.1100 mm (SD 1.09400); post molding 4.1100 mm (SD 1.21760) showed an increase of -3.00 (SD 1.45686.) which was calculated as very highly significant (P<0.0.01) at 2-tailed significance level. (table 1 , table 2 , table 3)

Table-3: Paired Sample Test

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	nl1 - nl2	-3.7200	2.36505	.33447	-4.3921	-3.0479	-11.122	49	.000
Pair 2	nw1 - nw2	2.2500	2.03603	.28794	1.6714	2.8286	7.814	49	.000
Pair 3	rnw1 - rnw2	1.7300	2.82158	.39903	.9281	2.5319	4.335	49	.000
Pair 4	lnw1 - lnw2	3.4600	2.83894	.40149	2.6532	4.2668	8.618	49	.000
Pair 5	rnh1 - rnh2	-2.3800	1.21873	.17235	-2.7264	-2.0336	-13.809	49	.000
Pair 6	lnh1 - lnh2	-3.0000	1.45686	.20603	-3.4140	-2.5860	-14.561	49	.000
Pair 7	rndh1 - rndh2	-2.6700	1.64630	.23282	-3.1379	-2.2021	-11.468	49	.000
Pair 8	lndh1 - lndh2	-3.6400	1.73805	.24580	-4.1339	-3.1461	-14.809	49	.000

DISCUSSION:

Treatment of the cleft lip and palate has been a challenge in regards to nasal symmetry [9]. The idea of correcting the nostril cartilage symmetry before primary lip repair was advocated by Matsuo and Hirose in 1991.They proposed that the degree of plasticity in neonatal cartilage is highest after birth and gradually reduces as infants grow. This might be due to high levels of hyaluronic acid in estrogen that was transferred from the mothers to the infants [10].

The introduction of passive realignment of the hard palate shelves has been introduced by McNeil and later by Burston[11, 12] This orthopedic approach makes CLP repair easier and may improve the aesthetic outcome of primary CL nasal repair by repositioning the alar base [13,14,15]. This Presurgical alveolar molding alone would guide separated maxillary alveolar segments into a normal position, and a complete osseous bridge might form when the cleft width is reduced.

Grayson et al. (1999) propose that definitive repair of cleft lip and nose should be done as early as possible and in 1993 he introduced a first presurgical NAM device,this technique can be applied successfully to patients with complete cleft lip and palate.Nam is a non surgical and passive method of treating cleft proposed benefits of traditional intraoral presurgical orthopedics[16]. Treatment of presurgical NAM should be initiated as soon as possible after birth because of the high degree of plasticity in neonatal cartilage which gradually reduces with time[9]. In accord with the chondral-modeling hypothesis this study indicate that NAM may be acting as an inductive mechanism that stimulate the activity of immature nasal chondroblasts, producing an interstitial expansion that is associated with improvement in nasal morphology[17]. Infants with presurgical nasoalveolar molding improved symmetry of the nose in width, height, and columella angle, as compared to their presurgical status[9],resulting in nasal profile improvement as well as decreases the alveolar cleft[18].This alignment of alveolar segments decrease the soft tissues tension and facilitating the lip surgery, thus, a better aesthetic and functional results can be achieved[19].It also forces the protruded premaxillary segment into alignment with the dental alveolar segments incase of bilateral cleft lip and palate, imporving the shape the maxillary arch too[20].

There fore, the use of the nasoalveolar molding technique (NAM) aims to reduce passively the width of the alveolar gap, while improving the AP discrepancy but also focusing on the nose. The appliance also facilitated primary nasal positioning, significantly improving nasal symmetry and nostril shape. The advantages of nasoalveolar presurgical infant orthopedics may be considered from a soft tissue perspective as well as from the usual osseous perspective. The presurgical reduction in soft tissue and cartilaginous deformity facilitates achievement of surgical soft tissue repair under minimal tension and optimal conditions for scar formation. There is also a reduction in the number and complexity of minor soft tissue revision surgeries required to maintain acceptable nasolabial aesthetics as the nose grows (Lee et al., 1999b). The long-term retention of nasal symmetry achieved by presurgical nasoalveolar molding was reported by Maull in 1999.The growth potential of the craniofacial complex of a child with a congenital cleft is not at variance with that of the normal craniofacial complex[21],but nasal deformity in infants with nasolabial clefts persists if it is not actively corrected. Presurgical nasoalveolar molding sets a smooth foundation on which the nose can be reconstructed by changing the alar cartilage and approximating the alveolar segments [22].There is no evidence that the use of the appliance has any negative impact on facial growth and development [23]. Thus to achieve the goals of presurgical nasoalveolar molding that is, to align and approximate the alveolar cleft segments while at the same time achieving correction of the nasal cartilage and soft tissue deformity, added a nasal stent to the labial vestibular flange of a conventional intraoral molding plate . A band of soft acrylic presses against the nasolabial fold. The combined effect of pushing the nasal tip forward and pressing back on the nasolabial fold results in gradual tissue expansion and lengthening of the columella. At the same time, the domes of the lower lateral nasal cartilages are brought together in the midline, and the intranasal lining is expanded[16].

The nasal stent and alveolar molding plate are adjusted gradually over a period of 3 months to achieve nasal and alveolar symmetry, nasal tip projection, and contact of the cleft alveolus just before primary lip, nasal, and alveolar surgical repair. The nasoalveolar orthopedic appliance is held in place with a combination of surgical tapes and elastics applied to the cheeks and cleft lip segments[24]. Ideal time for starting the nasoalveolar molding is just after the birth as soon as possible because as the newborn becomes older, the plasticity of both the hard and soft tissues reduces and molding becomes more difficult with proceeding time. The older the child the lesser the co-operation would be, as the child is more likely to learn to dislodge the molding appliance that makes the process even more difficult. If the appliance is lost or not worn then a cleft gap that had been closed earlier during molding therapy

may widen again as the infant places his or her tongue into the cleft.

The subjects evaluated in this study are not fully grown. NAM is a new therapy, and the subjects studied were representative of the earliest treated, therefore, further evaluation of changes with age is required when this group reaches adolescence and then adulthood.

Although the use of presurgical infant orthopaedic devices remains controversial, a growing collection of studies has shown that presurgical nasoalveolar molding provide safe, effective, and lasting improvements in the esthetics of the nasolabial complex in infants with unilateral or bilateral cleft deformities.[25] This technique can be extremely challenging but an excellent addition to a cleft lip and palate management. However, long-term studies will need to be performed that analyze the overall risks and benefits of this technique. [20]

CONCLUSION:

Infants with cleft lip and palate improved nasal symmetry in terms of nasal length, nasal width, nostril height, nostril width and nasal dome height when treated with presurgical nasoalveolar molding as compare to their presurgical status therefore creats more symmetrical noses.

REFERENCE:

1. Moreau JL, Caccamese JF, Coletti DP, Sauk JJ, Fisher JP.Tissue engineering solutions for cleft palates. J Craniomaxillofac Surg. 2007; 35(6): 78-86.
2. Bailey BJ et al.Head and Neck Surgery-otolaryngology. Philapdephia Lippincott-Raven, 1998.
3. Kima N, Baekb S. Cleft sidedness and congenitally missing or malformed permanent maxillary lateral incisors in Korean patients with unilateral cleft lip and alveolus or unilateral cleft lip and palate. Am J Orthod Dentofacial Orthop 2006; 130:752-8.
4. Cohen MM. Syndromes with cleft lip and palate.Cleft Palate J. 1978; 15:306-328.
5. Shprintzen RJ, Siegel VL, Amato J, et al: Anomalies associated with cleft lip, cleft palate, or both. Am J Med Genet.1985; 20:585-595.
6. Gorlin RJ, ChoenMM RCM Hennekam. Syndromes of the head and neck.4th Ed. New York, Oxford University Press, 2001:859
7. Gabriel SB, Schaffner SF, Nguyen H, Moore JM, Roy J, Blumenstiel B, Higgins J, DeFelice M, et al: The structure of haplotype blocks in the human genome. Science.2002; 21; 2225-9.
8. Josip B, Peter P, Thomas B, Jens W, Jochen F, Jürgen R. Treatment of patients with cleft lip, alveolus and palate-a short outline of history and current interdisciplinary treatment approaches. Journal Cranio-Maxillofacial. 2006; 34:17-21.
9. Pai BC, Ko EW, Huang C, Liou EJ. Symmetry of the Nose Presurgical Nasoalveolar Molding in Infants With Unilateral Cleft Lip and Palate: A Preliminary Study.Cleft Palate Craniofac J. 2005; 42:658-663.
10. Sigh GD, Moxham BJ, Langley MS, Waddington RJ, Embery G. Changes in the composition of glycosaminoglycans during normal palatogensisi in rat. Arch Oral Biol. 1994; 39:401-407.
11. McNeil CK. Orthodontic procedures in the treatment of congenital cleft palate. Dent Rec 1950; 70:126-132.
12. Burston WR. The early treatment of cleft palate conditions. Dent Pract 1958; 9: 41.
13. McComb HK. Primary correction of unilateral cleft lip nasal deformity: A 10-year review. Plast. Reconstr. Surg.1985; 75(6):791-9.
14. Salyer KE. Primary correction of the unilateral cleft lip nose: A 15-year experience. Plast. Reconstr. Surg. 1986; 77(4):558-68.
15. Papadopulos N, Papadopoulos M. Can intrauterine surgery improve the quality of life of cleft lip and palate patients? Hippokratia 2003, 7 (2): 59-80.
16. Grayson BH, Cutting CB. Presurgical Nasoalveolar Orthopedic Molding in Primary Correction of the Nose, Lip and Alveolus of Infants Born With Unilateral and Bilateral Clefts. Cleft Palate Craniofac J. 2001; 38: 193-98.
17. Hamrick MW. A chondral modeling theory revisited. J Theor Biol. 1999; 201:201-208.
18. Deng XH, Zhai JY, Jiang J, Li F, Pei X, Wang HT. A clinical study of presurgical nasoalveolar molding in infants with complete cleft lip and palate. Zhonghua Kou Qiang Yi Xue Za Zhi. 2005; 40(2):144-6.
19. Spengler AL, Chavarria C, Teichgraeber JF, Gateno J, Xia JJ. Cleft Palate Craniofac J. Presurgical nasoalveolar molding therapy for the treatment of bilateral cleft lip and

palate: A preliminary study. 2006; 43(3):321-8.
20. Delgado MD, Marti E, Romance A, Romero M, Lagarón E, Salván R, Herrero E. Presurgical orthopedic treatment for cleft lip and palate. Cir Pediatr.2004; 17(1):17-20.
21. Weil J. Orthopaedic Growth Guidance and Stimulation For Patients With Cleft Lip and Palate.Scandinavian Journal of Plastic and Reconstructive Surgery and Hand Surgery.1987;21(1):57–63.
22. Lo L. Primary correction of the unilateral cleft lip nasal deformity:Achieving the Excellence. Change Gung Med J.2003; 29:262-7
23. Yang S, Stelnicki EJ, Lee MN. Use of Nasoalveolar Molding Appliance to Direct Growth in Newborn Patient with Complete Unilateral Cleft Lip and Palate. Pediatr Dent. 2003; 25(3): 253-56.
24. Santiago PE, Grayson BH, Gianoutsos MP, Kwon SM, Brecht LE, Cutting CB. Reduced need for alveolar bone grafting by pre-surgical orthopedics and primary gingivoperiosteoplasty. Cleft Palate Craniofac J. 1998;35:77–80
25. Muall DJ, Grayson BH, Cutting, CB, et al. Longterm effects of nasoalveolar molding on three-dimensional nasal shape in unilateral clefts. Cleft Palate Craniofac. J. 1999; 36: 391-397.