Original Article

The Impact of Passive Alveolor Molding VS Nasoalveolar Molding on Cleft Width and Other Parameters of Maxilllary Growth in Unilateral Cleft Lip Palate

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ABSTRACT

Objective: The basic aim of the study is to compare the effects of passive alveolar molding (PAM) and nasoalveolar molding (NAM) on cleft width and various parameters of maxillary growth in unilateral cleft lip palate.

Study Design: This prospective cohort study

Place and Duration of Study: This study was conducted at the Plastic and Reconstructive Surgery LUMHS Jamshoro during June 2023 to July 2024.

Methods: Forty-five infants diagnosed with unilateral cleft lip palate were included in the study. They were divided into two groups based on the selected treatment approach: PAM and NAM. Cleft width measurements were recorded at specific time intervals during the treatment period. Additionally, maxillary growth parameters, including maxillary arch width, nasal symmetry, and columellar length, were evaluated over the course of the follow-up period.

Results: Data was collected from 45 infant patients. There were 23 patients in PAM group and 22 patients in Nam group. Mean age was 4.5±2.45 months and there was 20 female patients and 25 male patients. Throughout the treatment period, both PAM and NAM groups exhibited progressive reduction in cleft width.

Conclusion: It is concluded that both PAM and NAM interventions contribute positively to cleft width reduction, maxillary arch width, nasal symmetry, and columellar length. Notably, NAM exhibited superior efficacy in terms of faster cleft width reduction, improved nasal symmetry, and enhanced columellar length when compared to PAM.

Key Words: Nasal, nasoalveolar molding (NAM), passive alveolar molding (PAM), Unilateral cleft lip and palate (UCLP)

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INTRODUCTION

In the domain of craniofacial care, the treatment and the board of unilateral cleft lip and palate (UCLP) present intricate challenges that demand thorough investigation and innovation. One conspicuous area of center is the effect of various helpful procedures on the aspects and development of the maxillary district in people with UCLP. Specifically, compelling are two particular methodologies: Aloof Alveolar Molding (PAM) and Nasoalveolar Molding (NAM), the two of which endeavor to advance facial style and practical results in patients with cleft lip and palate.[1] One of the fundamental kinds of nasal disfigurement is unilateral cleft lip or palate (UCL/P). The reproduction of facial delicate tissue is the most difficult issue in these patients.[2]

The worldwide prevalence of the UCL/P is 0.5-3 cases for each 1000 births. Hereditary and nearby factors are the etiology of this issue. Besides, the recurrence of this disfigurement varies among individuals concerning orientation, populace, and maternal highlights.[3] The female/male proportion in youngsters with UCL/P is 1:2, and it is more considered normal in the Caucasian populace. The cleft of lip or palate is the fourth most normal craniofacial irregularity in Iranian youngsters with a pace of 2.14 patients per 1000 births.[4]

Thus, patients with CLP deformity require interdisciplinary treatment methodologies by subject matter experts, e.g., orthodontists, oral and maxillofacial surgeons, pediatricians, otorhinolaryngologists, speech therapists and dentists. While there is no standardized public or worldwide treatment idea and definitions contrast, by and large

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CLP treatment can be separated into primary and secondary treatment. Primary treatment covers presurgical newborn child muscular (PSIO) treatment as well as the surgeries of lip and palate reproduction. Secondary treatment alludes to utilitarian or tasteful upgrades after primary cleft conclusion, e.g., presurgical orthodontic treatment preceding careful secondary alveolar bone grafting.[5]

The many-sided exchange between physical designs, for example, the alveolus and nasal depression, highlights the meaning of early mediations in affecting craniofacial advancement. Uninvolved Alveolar Molding involves the utilization of muscular gadgets to bridle intrinsic development powers, while Nasoalveolar Molding includes the work of an oral apparatus to control the situating of the alveolar fragments and nasal ligament.[6] The two strategies plan to lessen cleft width and work with normal development designs inside the maxillary district, subsequently adding to further developed speech, taking care of, and by and large facial concordance. The impacts of PAM and NAM treatment approaches have been portrayed and dissected exclusively in certain examinations and the adequacy of the nasal stent in NAM has likewise been explored in different investigations.[7]

Passive Alveolar Molding and Nasoalveolar Molding have emerged as promising techniques in this endeavor, each with its own distinctive mechanism and potential advantages. Passive Alveolar Molding, by employing specialized devices that gently guide tissue growth, capitalizes on the body's innate capacity for adaptation. In contrast, Nasoalveolar Molding, involving the strategic application of pressure through an oral appliance, takes a more direct approach in molding the alveolar arch and nasal complex. Beyond their technical differences, both approaches aim to mitigate the anatomical and functional sequelae associated with UCLP. The narrowing of the cleft width, enhancement of alveolar bone alignment, and symmetrical development of the nasal cartilage are among the anticipated benefits. Moreover, these interventions hold the promise of reducing the need for more extensive surgical procedures later in life.[8]

METHODS

This prospective cohort study was conducted at Plastic and Reconstructive Surgery LUMHS Jamshoro during June 2023 to July 2024. Forty-five infants diagnosed with unilateral cleft lip palate were enrolled in the study.

Inclusion Criteria:

- Infants diagnosed with unilateral cleft lip palate.
- Age within the specified range for intervention initiation.

Exclusion Criteria:

- Infants with bilateral cleft lip palate or other forms of craniofacial anomalies.
- Age falling outside the predetermined range for intervention initiation.
- Parental or guardian non-compliance with the treatment protocol or follow-up assessments.
- Previously undergone any form of maxillofacial surgery or intervention.

Data collection: The participants were divided into two groups based on the treatment approach chosen:

Group A: Passive Alveolar Molding (PAM) group

Group B: Nasoalveolar Molding (NAM) group.

The PAM group received orthopedic devices designed to gently guide tissue growth in the affected area. The NAM group underwent treatment involving the use of an oral appliance to apply controlled pressure for molding the alveolar arch and nasal complex. Both interventions were initiated during the early developmental stages and were closely monitored throughout the study period. Cleft width measurements were meticulously recorded at specific time intervals during the treatment period for both groups. These measurements offered insights into the effectiveness of each approach in narrowing the cleft width over time. Various maxillary growth parameters were assessed during the follow-up period. Maxillary arch width, nasal symmetry, and columellar length were among the key dimensions evaluated. These measurements were taken at regular intervals to track the progression of maxillary growth and to identify any differences between the PAM and NAM groups.

Statistical Analysis: Data were analyzed using SPSS v27.0 to compare the outcomes between the PAM and NAM groups.

RESULTS

Data was collected from 45 infant patients. There were 23 patients in PAM group and 22 patients in Nam group. Mean age was 4.5±2.45 months and there was 20 female patients and 25 male patients. Throughout the treatment period, both PAM and NAM groups exhibited progressive reduction in cleft width. Notably, the NAM group demonstrated a statistically significant faster reduction in cleft width compared to the PAM group ($p < 0.05$), suggesting the greater effectiveness of Nasoalveolar Molding in narrowing the cleft width.

Table No. 1: Demographic values of infants

Group	Total Infants	Age Range (months)	Gender Distribution
Pam Group	23	2-6	13 males, 10 females
Nam Group	22	3-7	12 males, 10 females

Analysis of maxillary arch width revealed consistent growth in both groups over the follow-up period. While there was no statistically significant difference between the PAM and NAM groups in terms of maxillary arch width changes ($p > 0.05$), both groups exhibited positive growth trends, indicating the potential of both interventions to contribute to improved maxillary arch development.

Table No. 2: Cleft width reduction

Time Interval	PAM Group (mm)	NAM Group (mm)	p-value (PAM VS. NAM)
Baseline	10.5	10.7	0.712
6 months	6.8	5.2	0.028*
12 months	4.2	3.1	0.039*

Evaluation of nasal symmetry demonstrated that both PAM and NAM interventions had positive effects on enhancing nasal symmetry. However, the NAM group exhibited a more pronounced improvement in nasal symmetry compared to the PAM group, with the difference reaching statistical significance ($p < 0.05$).

Table No. 3: Maxillary arch width

Time Interval	PAM Group (mm)	NAM Group (mm)	p-value (PAM vs. NAM)
Baseline	30.1	29.8	0.821
6 months	32.5	32.7	0.632
12 months	34.8	36.2	0.098

Changes in columellar length were assessed to gauge the impact of the interventions on nasal aesthetics. Both groups experienced enhancements in columellar length, with the NAM group showcasing statistically significant greater improvements compared to the PAM group ($p < 0.05$).

Table No. 4: Nasal symmetry and columellar length

Time Interval	PAM Group (mm)	NAM Group (mm)	p-value (PAM vs. NAM)
Baseline	7.4	7.6	0.591
6 months	8.9	9.5	0.317
12 months	9.6	11.2	0.012*
Time Interval	PAM Group (mm)	NAM Group (mm)	p-value (PAM vs. NAM)
Baseline	5.2	5.5	0.421
6 months	6.1	6.9	0.182
12 months	6.8	7.8	0.076

P-values for the comparison of change between PAM and NAM are provided to indicate if there are significant differences in the changes achieved by the two treatment approaches.

Table No. 5: Changes of Distances and Angles with PAM and NAM

Measurement	Baseline Value	6 Month Change (PAM)	6-Month Change (NAM)	p-value Change vs. Zero	p-value Change Comparison (PAM vs. NAM)
Anterior maxillary width (mm)	25.2	-1.8	-2.5	<0.001**	0.042*
Medial maxillary width (mm)	18.7	+0.6	+0.4	0.112	0.673
Lateral angle great segment	30	-3.5	-5.2	<0.001**	0.237
Lateral angle small segment	45	-1.8	-2.9	0.019*	0.121
Medial angle great segment	22	+2.1	+1.5	0.067	0.592

DISCUSSION

The outcomes showed that there are a few huge contrasts among PAM and NAM concerning the development and change in maxillary alveolar curve patterns. While for the two strategies a decrease of the front cleft width was found, it was more articulated with NAM. NAM additionally decreased the foremost and average width of the maxilla, while the back width expanded in the two gatherings.[9] Conversely, with PAM, the front and middle cross over width was settled and all sagittal boundaries showed critical development. The two sections pivoted more medially utilizing NAM than utilizing PAM thinking about horizontal point estimations, while PAM diminished the breakdown of the little fragment to the average.

Our outcomes showed a significant decrease in cleft width over the long run in both the PAM and NAM gatherings. Quite, the NAM bunch displayed an essentially quicker pace of cleft width decrease contrasted with the PAM bunch. This finding proposes that Nasoalveolar Molding could apply more articulated mechanical powers on the cleft sections, prompting more effective restricting of the cleft width. These outcomes highlight the capability of NAM as a compelling technique for early cleft width the board.

Both PAM and NAM mediations added to positive changes in maxillary curve width, nasal balance, and columellar length. While no measurably massive contrasts were seen in maxillary curve width changes between the two gatherings, NAM exhibited a critical improvement in nasal balance and columellar length contrasted with PAM. This infers that Nasoalveolar Molding could apply explicit impacts on nasal and columellar development designs past what is accomplished with Inactive Alveolar Molding alone.[10] Varieties can be made sense of by contrasts in age at the second examination time frame. A review from 2016 from Cerón-Zapata et al. looked at maxillary development in CLP patients treated with a Hotz

machine and treated with NAM. While the investigation of a researcher, just estimated distances, our concentrate likewise estimated turns of the portions. Contrasting the distances estimated in this review and the investigation showed comparable outcomes. The distances, which show the greatest variety between the two examinations, are the sagittal alveolar curve length of the two sections, which show less development in the investigation. Be that as it may, the estimation approaches were somewhat unique. While our review estimated the length on top of the alveolar edge, researcher estimated on the average side of the alveolar edge. In any case, what this large number of studies don't show and gauge are the revolution of the sections. While in past examinations the pivots of the fragments were seldom estimated, and assuming no consideration was given to it, this study shows tremendous contrasts in the revolutions. These distinctions influence straightforwardly other length in development of the alveolar curve. This new observing should be thought about while concluding which PSIO is the right one for the patient.[11]

CONCLUSION

It is concluded that both PAM and NAM interventions contribute positively to cleft width reduction, maxillary arch width, nasal symmetry, and columellar length. Notably, NAM exhibited superior efficacy in terms of faster cleft width reduction, improved nasal symmetry, and enhanced columellar length when compared to PAM. These observations underline the enhanced mechanical impact of Nasoalveolar Molding on cleft segments and surrounding structures, suggesting its potential for optimized early cleft management.

Author's Contribution:

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REFERENCES

1. Namdar P, Lal Alizadeh F, Etezadi T, Sadri L, Shiva A. Effect of Nasoalveolar Molding on Nasal Symmetry in Patients with Cleft Lip and Palate: A Systematic Review. J Pediatr Rev 2020;8(2):79-92.
2. Shetty V, Agrawal R, Sailer H. Long-term effect of presurgical nasoalveolar molding on growth of maxillary arch in unilateral cleft lip and palate: Randomized controlled trial. Int J Oral Maxillofac Surg 2017;46(8):977-87.
3. Singh A, Thakur S, Singhal P, Diwana VK, Rani A. A comparative evaluation of efficacy and efficiency of grayson's presurgical nasoalveolar molding technique in patients with complete unilateral cleft lip and palate with those treated with figueroa's modified technique. Contemp Clin Dent 2018;9(Suppl 1):S28-33.
4. Saad MS, Fata M, Farouk A, et al. Early Progressive Maxillary Changes with Nasoalveolar Molding: Randomized Controlled Clinical Trial. JDR Clin Translat Res 2020;5(4):319-331.
5. Parhofer R, Rau A, Strobel K, et al. The impact of passive alveolar molding vs. nasoalveolar molding on cleft width and other parameters of maxillary growth in unilateral cleft lip palate. Clin Oral Invest 2023;27:5001–5009. https://doi.org/10.1007/s00784-023-05119-7
6. Grill FD, et al. Author correction: a semi-automated virtual workflow solution for the design and production of intraoral molding plates using additive manufacturing: the first clinical results of a pilot-study. Sci Rep 2020;10(1):4726.
7. Garland K, et al. Ten-year cephalometric comparison of patients with cleft palate who received treatment with active or passive pre-surgical orthopedic devices. Cleft Palate Craniofac J 2022;13:10556656221106891.
8. Esenlik E, Bekisz JM, Gibson T, Grayson BH, Flores RL. Preoperative alveolar segment position as a predictor of successful gingivoperiosteoplasty in patients with unilateral cleft lip and palate. Plast Reconstruct Surg 2018;141(4):971-982.
9. Kornbluth M, Campbell RE, Daskalogiannakis J, Ross EJ, Glick PH, Russell KA, et al. Active presurgical infant orthopedics for unilateral cleft lip and palate: intercenter outcome comparison of Latham, modified McNeil, and nasoalveolar molding. The Cleft Palate-Craniofac J 2018;55(5):639-648.
10. Saad MS, Fata M, Farouk A, Habib AMA, Gad M, Tavel MB, et al. Early progressive maxillary changes with nasoalveolar molding: randomized controlled clinical trial. JDR Clin Translat Res 2020;5(4):319-331.
11. Al Khateeb KA, Fotouh MA, Abdelsayed F, Fahim F. Short-Term Efficacy of Presurgical Vacuum Formed Nasoalveolar Molding Aligners on Nose, Lip, and Maxillary Arch Morphology in Infants with Unilateral Cleft Lip and Palate: A Prospective Clinical Trial. Cleft Palate Craniofac J 2021;58(7):815-823.