

Correction of Unilateral Cleft Lip, Palate and Alveolus by Presurgical Nasoalveolar Molding using Modified Nasal Stent- A Case Report

T NOUFAL¹, SHOAB ULLA KHAN², B GOUTHAM³, SUNIL MUDDAIAH⁴, SANJU SOMAIAH⁵



ABSTRACT

Cleft deformities may lead to psychological problems, dental problems, and aesthetic problems, if left untreated. Hence, the management of cleft patients is quite challenging and controversial which involves a multidisciplinary approach including members of various specialities. The Presurgical Nasoalveolar Molding (PNAM) method is an innovative therapy for mitigating the impact of craniofacial deformities. The use of PNAM therapy in a 2-day-old male infant is described in this case report. Impressions were taken during the first visit and on the same day lip tape therapy (lip taping) was started using 3M™ Steri Strip™. The Nasoalveolar Molding (NAM) plate was delivered to approximate the cleft alveolus. A modified nasal stent appliance was administered until the cleft gap was decreased to around 4 mm and the cleft lip was repaired through surgery. The use of PNAM with the modified nasal stent appliance showed promise in lowering the amount of the cleft deformity of the lip, palate, and alveolus, with improving nasal aesthetics. When comparing pre-NAM to post-NAM, there was also a considerable reduction in the alveolar defect. In cleft patients, the PNAM-assisted primary reconstruction employing a nasal stent appliance resulted in an overall improvement of the nasolabial complex, enhanced aesthetics, and a reduction in the extent of surgery and surgical operations.

Keywords: Lip taping, Nasolabial complex, Steri strip™

CASE REPORT

A 2-day-old male infant (weighing 2.8 kg) reported to the Department of Orthodontics with the patient's parents complaining of a cut on the lip and difficulty in feeding with mother having no history of any medications or injury during pregnancy.

The baby had a full solitary cleft lip, facial deformity, alveolus, and palate abnormalities on the left side; the cleft gap was 11 mm in size [Table/Fig-1a,b]. The case was evaluated, and it was decided to start the treatment with PNAM procedure. This procedure was chosen because it is the only method where the alveolar molding was done, and it minimises the extent of the intraoral alveolar cleft and the surrounding soft tissues impacted by the cleft. The parents were explained about the same along with the benefits and viable complications. Throughout the treatment, the need of parental support was emphasised. Parents were told about the placement of an intraoral acrylic plate, which would help the newborn achieve functional benefits such as improved feeding without nasal spillage.



[Table/Fig-1]: Pre NAM extraoral photographs of the patient showing cleft lip and palate. a) Frontal view; b) Lateral view.

Parents were also told about the drawbacks, which included intraoral lesions caused by rough spots on the tray and extraoral inflammation on the cheeks from improper tape detachment. After the explanation of the procedure and related complications, an intraoral primary maxillary impression with the help of modelling wax sheet dipped and softened in mild warm water

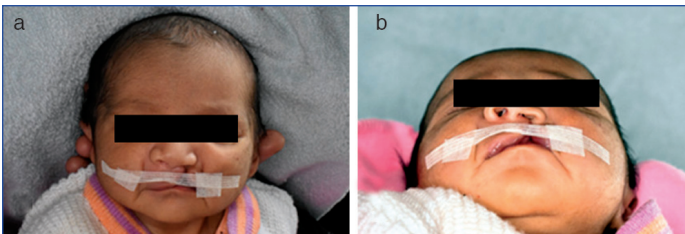
was taken [Table/Fig-2]. The initial cast was poured, and the secondary impression was made using a special tray made of clear acrylic resin.



[Table/Fig-2]: Primary impression with modelling wax.

Using Steri Strip™ (3M Steri Strip™) lip taping was done on the same day. Two distinct kinds of tapes were placed to the cheeks-base tape and a hydrocolloid type bandage that acted as a barrier between the holding tapes and the cheeks, reducing tissue irritation. Parents were instructed about lip taping that should be continued for a week [Table/Fig-3a,b].

By using the custom tray with elastomeric material (Light body Regular set and Putty material, START KIT), the secondary impression was taken. The baby was in his mother's lap with head facing downward, mother cradled the baby securely around the chest and torso, while the imprint was taken, support to the head and neck was provided. To avoid an obstruction of the airway, the newborn was made to wail while the imprint was taken. The excess impression material posterior to the tray was removed by



[Table/Fig-3]: Lip taping showing approximation of the cleft lip (a and b).

finger motion, which would have also compromised the airway. Secondary impressions were poured with orthokral stone and two casts were procured, one as a working model and second for study model. Modelling wax was used to cover the alveolar gap and any other undercut spots on the physical model [Table/Fig-4a], and an auto-polymerising transparent acrylic resin plate (DPI-RR Cold Cure, Acrylic repair material), of at least 2 mm thickness was created [Table/Fig-4b].

In some older techniques by Grayson BH and Cutting CB, traditional NAM pushes or stretches the delicate tissues, to overcome this we followed the modified NAM technique [1] with an active palatal plate (gently directs alveolar growth). The palatal plate trial was performed, the proper fit and any rough surfaces were checked and smoothed. To hold the intraoral plate, a retentive button was then added in the centre of the NAM plate. Extraoral rubber tape provides support for this retentive button [Table/Fig-4c,d].



[Table/Fig-4]: a) The extent of deformity which has been covered with the wax in physical model; b) NAM plate with the retentive handle; c and d) NAM plate intraorally with the retentive button in place to allow the nasoalveolar molding.

The real molding plate was put into the baby's mouth in the next appointment. To make sure the proper fit and retention of molding plate, red orthodontic elastics of 0.25 inch diameter were used on to the handle of the NAM plate. Later, Steri Strips™ were extended and attached to the base tapes on the infant's cheeks [Table/Fig-4c,d].

The above-mentioned linkages established a great backward and superior retentive force. To keep the plate in place, Steri Strip™ and red elastics were changed once daily. A modified nasal stent was administered after two and a half months, when the cleft gap was decreased roughly to 4 mm from 11 mm, to improve retention. This appliance was a modification to the conventional nasal stent attachment, which is less bulky and has a projection of acrylic material, supported by round stainless-steel wire which was attached to the forehead [Table/Fig-5a,b]. This appliance included a nasal stent that was covered in a soft reliner, while taking support from the forehead and put passively into the nose, as well as Steri Strip™

provided support from the forehead. The phase of active nasal cartilage molding was started which was achieved by lifting the collapsed side of the nostril with the modified nasal stent appliance [Table/Fig-5c,d].



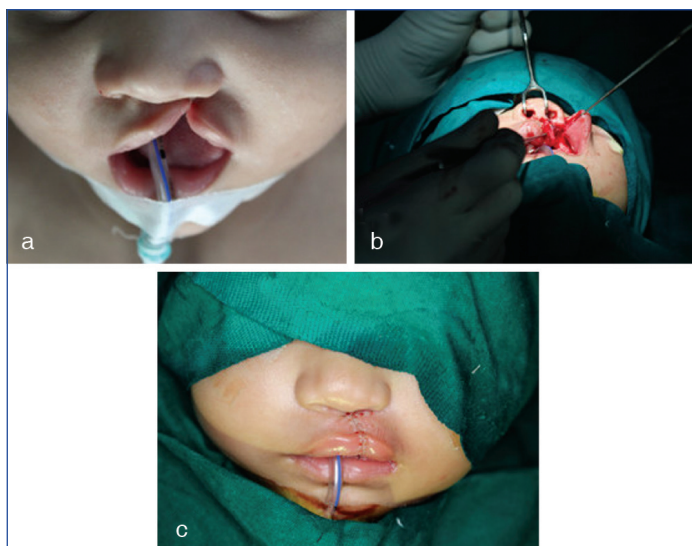
[Table/Fig-5]: a and b) Modified nasal stent intraorally which takes the support from the forehead and lifts the flattened left nasal area; c and d) Modified nasal stent.

The infant's weight increased from 2.5 kg to 5 kg by using NAM plate over the course of treatment. After the completion of the NAM procedure, the authors noticed the difference in the alveolar cleft- the length of columella was increased, the nasal cartilage symmetry was improved and collapsed nostril was directed to normal [Table/Fig-6a,b,c,d,e].

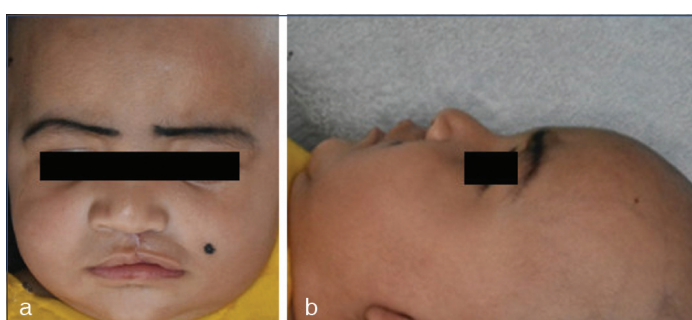


[Table/Fig-6]: Comparison of Pre and Post NAM (a and b-intraorally; c and d-extraorally; e-casts models), the reduction in the cleft deformity, improvement in the nasal area, lips approximation was achieved and the reduction in the alveolar ridge deformity can also be seen from the casts.

Three months after initiation of PNAM, Oral and Maxillofacial surgeon and Orthodontist evaluated the position of lips, alveolus, and nasal area. [Table/Fig-7a,b and c] shows the pictures taken at the time of surgery. After the procedure, the modified nasal stent appliance was discarded, following improvement in the cleft lip [Table/Fig-8a,b].



[Table/Fig-7]: Surgical repositioning of flap. a) Oral intubation; b) Surgical repositioning; c) Postoperative



[Table/Fig-8]: a and b) Post surgical healing and improvement in the cleft deformity.

DISCUSSION

Cleft deformities may lead to psychological problems, dental problems and aesthetic problems if left untreated. Hence, the management of cleft patients is quite challenging and controversial which involves multidisciplinary approach including members of various specialities [1].

In the treatment of patients with cleft palate, Grayson BH et al., invented the notion of nasoalveolar molding, which coupled a nasal molding stent with a passive preoperative molding equipment [2]. The labial tapes have been used to approximate alveolar gap with acrylic plate. Nasal stents aid in the molding of nasal cartilage and improves nasal symmetry. For retention, two elastic face tapes were utilised. The most common negative effects of NAM therapy, according to Grayson, are soft-tissue irritation and ulceration [2]. By sculpting the bony segments, PNAM minimises the extent of the intraoral alveolar cleft and the surrounding soft tissues impacted by the cleft [3,4]. A nasal stent, which enters the nasal aperture from the labial flange of a standard oral molding, was used to achieve this, on the other hand modified nasal stent appliance took support from the forehead. The modified nasal stent gives better comfort than conventional method and retention of Presurgical Infant Orthopaedic (PSIO) appliance is not disturbed [5].

Grayson BH and Cutting CB described an alveolar molding process that has been refined multiple times [1]. Parents co-operation and adequate compliance is required during the PNAM procedure. PNAM procedure should begin as early as possible because after two months of life the infant's cartilages begins to dwindle and reduce its plasticity [6]. NAM plate helps to reduce the level of deformity, deviation, and dislocation of the damaged structures before surgery [7].

Misdirected molding, nose over expansion, and exposure of the primary tooth bud are few of the drawbacks of NAM [8]. A hole in the centre of the NAM plate is added to lessen the effect of airway

blockage caused by dislodgement of the NAM appliance. Failure of the moulded nasal cartilages were around after one year of age. Some relapses of the nostril form in breadth (10%), height (20%), and columella angle (4.7%) were reported [8]. Conventional nasal stent has a disadvantage, such as reciprocal molding force against the alveolar segment was removed by using NAM plate and modified nasal stent appliance [9]. NAM plate is less bulky than the conventional appliance and enhances the retention of molding plate. In cleft cases, the PNAM assisted primary reconstruction by adopting the above-mentioned appliance resulted in an overall improvement of the nasolabial complex [9].

In this case report, modified nasal stent appliance was used with NAM plate which is easy to fabricate and use to achieve near to normal anatomy of alveolus and lip before surgery [9]. Because the nasal stent and NAM plate are independent of one another, this appliance enhances retention and helps to avoid the unwanted intraoral reciprocal molding force that obstructs alveolus fusion [9]. During the surgical procedure of lip, the tension was minimal due to the use of presurgical lip taping.

Titiz S and Aras A in their recent article used a stent on the non cleft nostril that accelerates the nasal molding process by taking advantage of the plasticity of the tissues [10]. The modified Figueroa NAM technique is a good alternative to the standard Figueroa NAM approach since it makes appliance adjustment easier during follow-up [11]. Jodeh DS et al., employed the addition of orthodontic buttons to the Latham Dentomaxillary Appliance (DMA) in place of a screw mechanism which drastically reduces the amount of time required to approximate the cleft segments [12]. The main benefit of employing a modified nasal stent appliance is that it eliminates the disadvantage of using a traditional nasal stent where the alveolar segments are shaped by a bilateral intraoral molding force.

CONCLUSION(S)

Presurgical Nasoalveolar Molding using modified nasal stent gave a promising result by reducing the extent of the cleft deformity of lip, palate, alveolus and improving the nasal aesthetics. Prior to surgery, PNAM proved to be a useful supplementary therapy in minimising the cleft deformity from 11 mm to 4 mm. Aesthetics were enhanced and the number of surgical treatments was whittled down. There were added psychological benefits, satisfaction with facial appearance was also improved prior to primary surgical lip repair.

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PARTICULARS OF CONTRIBUTORS:

1. Postgraduate Student, Department of Orthodontics and Dentofacial Orthopaedics, Coorg Institute of Dental Sciences, Virajpete, Karnataka, India.
2. Postgraduate Student, Department of Orthodontics and Dentofacial Orthopaedics, Coorg Institute of Dental Sciences, Virajpete, Karnataka, India.
3. Professor and Head, Department of Orthodontics and Dentofacial Orthopaedics, Coorg Institute of Dental Sciences, Virajpete, Karnataka, India.
4. Professor and Dean, Department of Orthodontics and Dentofacial Orthopaedics, Coorg Institute of Dental Sciences, Virajpete, Karnataka, India.
5. Professor, Department of Orthodontics and Dentofacial Orthopaedics, Coorg Institute of Dental Sciences, Virajpete, Karnataka, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Shoab Ulla Khan,
Postgraduate Student, Department of Orthodontics and Dentofacial Orthopaedics,
Coorg Institute of Dental Sciences, Near Maguula Village, Kanjitanda Kusalappa
Campus, Virajpete, Karnataka, India.
E-mail: drshoabkhan.sk@gmail.com

PLAGIARISM CHECKING METHODS: [\[Jain H et al.\]](#)

- Plagiarism X-checker: Jan 28, 2022
- Manual Googling: Apr 04, 2022
- iThenticate Software: May 30, 2022 (9%)

ETYMOLOGY: Author Origin**AUTHOR DECLARATION:**

- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? No
- For any images presented appropriate consent has been obtained from the subjects. No

Date of Submission: **Jan 25, 2022**Date of Peer Review: **Feb 24, 2022**Date of Acceptance: **Apr 12, 2022**Date of Publishing: **Jun 01, 2022**