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CASE REPORT

An Extraoral Nasoalveolar Molding Technique in Complete Unilateral Cleft Lip and Palate

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Summary: Although nasoalveolar molding is commonly performed before cleft lip surgery, customized palatal plate availability is limited for patients far from a hospital. This case report describes a preformed extraoral nasoalveolar molding (PENAM) appliance and treatment approach for presurgical nasoalveolar molding in newborns with complete unilateral cleft lip and palate. A 12-day-old boy presented with complete unilateral cleft lip and palate. The PENAM device was supported by an adhesive-taped upper lip, which consisted of a lip nasal stent made from a 0.5-mm stainless steel wire. The spring was activated monthly. The shape of the cartilaginous septum, alar cartilage tip, medial crus, lateral crus, and alveolar segments was molded to resemble the normal shape of these structures. The 9.3-mm alveolar gaps were reduced and approximated. The approximation mostly came from the major alveolus segment with approximately 6.4-mm movement. Cleft side nostril height increased 5.5 mm and deviation of the columella was corrected by 42°. PENAM can be helpful in infants with unilateral cleft lip and palate because it has benefits for long-term forced delivery, requires less frequent activations, and is suitable for patients who live far from a hospital. *(Plast Reconstr Surg Glob Open 2013;1:e26; doi:10.1097/GOX.0b013e31829e0d4b; Published online 8 July 2013.)*

Grayson et al[1] and Cutting et al[2] first described presurgical nasoalveolar molding (NAM), a widely accepted approach taken before cheiloplasty for newborns with cleft lip, alveolus, and palate. This procedure is achieved with an acrylic palatal plate and nasal stent to mold the alveolar process and nasal alar cartilage into normal form and position. Although NAM has numerous benefits, some drawbacks limit NAM application in many patients, especially patients who live in remote areas and cannot make frequent visits. Further, in NAM, the molding plate must properly relieve all areas exerting excessive pressure and carries the risk of the molding plate becoming dislodged.[3]

Without an active oral palate, the adhesive lip-taping technique alone can decrease the gaps between alveolar segments and the tension of the lip.[4] As an alternative for achieving the same goal, we designed and used preformed extraoral nasoalveolar molding (PENAM) device in our practice, and introduce it here, illustrated by a typical case report.

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CASE REPORT

A family from North China (He Bei Province, China) brought their 12-day-old systematically healthy boy with right complete unilateral cleft lip and palate to our unit for consultation. He had a nasal deformity and alveolar segment displacement (Fig. 1). The intraoral cleft gap was 9.3 mm. The parents were instructed to use tape to approximate the cleft lip segments. Controlled movement of the alveolar segments was obtained by tight positioning of lip segments with adhesive tape strips (3M Nexcare Micropore) and 2 small pieces of skin barrier (hydrocolloid thin dress-

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Fig. 1. The image shows a 12-day-old male newborn with cleft lip, alveolus, and palate. Note the nose distortion.

ing, 3M Tegaderm) to protect the skin on the cheeks. The prefabricated PENAM appliance was adhered at the first visit onto the taped prolabium part of the upper lip with another strip of tape. Areas of the appliance that touched the nose were made with a soft plastic material, ethylene vinyl acetate (EVA), making it easier for the newborn to tolerate.

A frame of 5×25-mm height × width, respectively, was bent from a 0.5-mm stainless steel wire. The taped lip was used as a support base for the nasal stent to mold the nasal cartilage. The nasal stent was shaped into a bilobed form resembling a kidney. The upper lobe of the stent was positioned inside the nose, 3 mm deep underneath the dome of the alar cartilage and the lower lobe outside the nostril to mold the alar rim on the cleft side (Fig. 2).

At each appointment, the bilobed nasal stent was enlarged with the same EVA to gently lift the alar dome cartilage and slowly mold the depressed and concave lateral cartilage on the cleft side. The parents were instructed to keep the appliance in place at all times except for daily cleaning. Because they lived far from the hospital, only 4 follow-up appointments were arranged during a total of 17 weeks of activation.

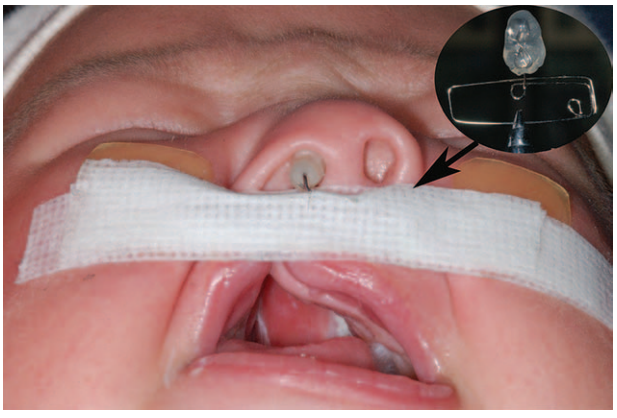

Fig. 2. The image shows the newborn with the PENAM in position and a stainless steel frame with a piece of soft EVA on the top-forming nasal stent. After 1 mo of wear, with some degree of activation, the nose was upright and cleft narrow.

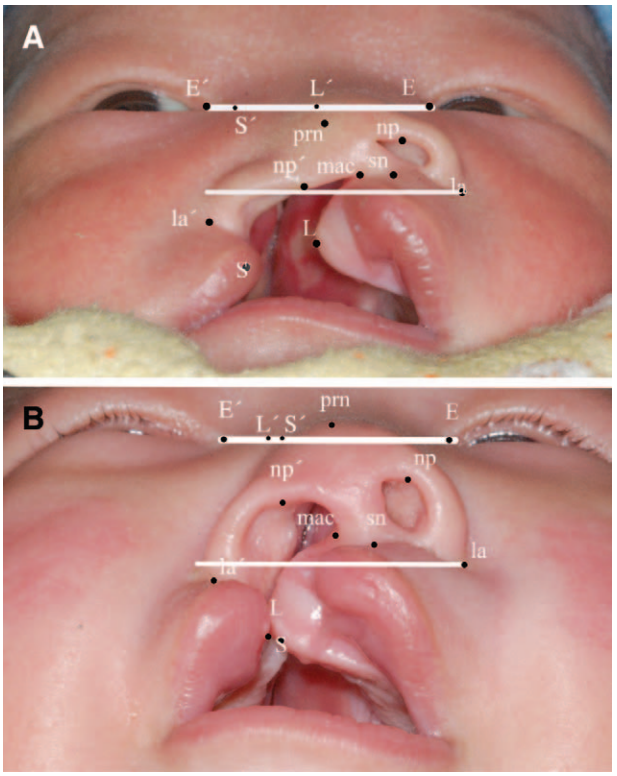

Fig. 3. The images show the landmarks used in the photographs before PENAM (A) and after PENAM (B). The reference points are as follows: pronasale (prn), highest point of the columella; subnasale (sn), the junction point of the columella and philtrum; lateral alar of the unaffected side (la), point of the conjunction of the lateral alar to the labial tissue on the unaffected side; lateral alar of the affected side (la′), point of conjunction of the lateral alar to the labial tissue on the affected side; and medial alar cartilage (mac), point of conjunction of the medial alar cartilage to the labial tissue on the affected side. The reference lines are eye-to-eye line (E-E′) and its parallel line, la line. L Nostril peak point of the unaffected side (np) and the affected side (np′), highest points of the nostril from la line; L, midpoint of the margin of the larger alveolar process medial to the cleft; S, midpoint of the margin of the smaller alveolar process lateral to the cleft; L′, L foot of a perpendicular line to the E-E′ line; S′, S foot of a perpendicular to the E-E′ line.

The 9.3-mm intraoral cleft gap was completely approximated at the 14th week by gradual activations. The PENAM appliance was on the patient for a total of 90 days. When the patient was 102 days old, the alveolar segments were close enough to touch and the nasal cartilages, columella, and philtrum aligned to facilitate surgical restoration of normal anatomic relationships. Most approximation came from the major alveolus segment with 6.4-mm opposite movement. Cleft side nostril height increased 5.5 mm

Table 1. Linear Measurements of Maxillary Photographs

Maxillary Measurements	Landmarks	T_0 (mm)	T_1 (mm)	Change ($T_1 - T_0$) (mm)
Cleft width	L-S	9.30	−1.00	−10.30
Larger alveolar	E-L′	12.13	18.53	6.40
Smaller alveolar	S′-E′	3.22	6.08	2.86

Reference line is the la line, which is parallel to E-E′.
E-E′, eye-to-eye line; L, midpoint of the margin of the larger alveolar process medial to the cleft; L′, L foot of a perpendicular line to the E-E′ line; S, midpoint of the margin of the smaller alveolar process lateral to the cleft; S′, S foot of a perpendicular to the E-E′ line.

Table 2. Linear and Angular Measurements of Nasal Photographs

Nasal Measurements	Landmarks	T_0	T_1	Change ($T_1 - T_0$)
Alar width (unaffected side) (mm)	la-sn	6.58	8.00	1.42
Alar width (affected side) (mm)	sn-la′	19.56	17.16	−2.40
Total alar base (mm)	la-la′	27.30	26.12	−1.19
Nostril height (unaffected side) (mm)	np-la line	4.53	8.79	4.26
Nostril height (affected side) (mm)	np′-la line	0.88	6.40	5.52
Columella deviation angle (°)	Angle between la-la′ and sn-prn	37.00	79.00	42.00
Alar base deviation (°)	Angle between la-la′ and E-E′	11.60	5.90	5.70

Reference line is the la line, which is parallel to E-E′.
E-E′, eye-to-eye line; la, lateral alar of the unaffected side; la′, lateral alar of the affected side; np, L nostril peak point of the unaffected side; np′, L nostril peak point of the affected side; prn, pronasale; sn, subnasale.

and columella deviation was corrected by 42°. The nasal width decreased 2.4 mm and the alar cartilages molded to a more normal shape (Fig. 3) (Tables 1 and 2).

Ethical Approval

We read and complied with the instructions to authors and in particular the policy of the journal on ethical consent. Ethical consent was granted by the ethical committee at Peking Union Medical College Hospital.

DISCUSSION

Our PENAM protocol is simple and requires only integration of the adhesive lip-taping technique and a small prefabricated nasal stent. The lip-taping technique was initiated by Brown,[5] who advocated adhesive tape application across lip segments before lip repair to help reduce deformity. The forces at work with lip taping have a more functional effect on maxillary growth because they establish orbicularis muscle continuity.

PENAM attempts to push the greater segment of the alveolar ridges toward the lesser segments during sucking to bring the gum segments together by reducing the size of the gap in the mouth, stretch the lip muscles, reposition the deformed nasal cartilages, and lengthen the deficient columella. Lip taping also offers a solid and intact new base for the preformed lip nasal stent.

In this case, the nasal stent was placed at the initial appointment, so obvious improvement was seen at the second visit (after 18 d). PENAM increases efficiency in treating patients because the necessary clinical skills are simple. Through training, parents can apply PENAM by themselves. Fewer visits and non-custom-made devices of the PENAM result in substantial cost savings.

CONCLUSIONS

In this study, PENAM integrated a preformed lip nasal stent with an adhesive lip-taping approach. An easy PENAM without a complicated oral part has some alternative effects compared with the NAM device, especially for early orthopedics in more cleft lip and palate patients who cannot see orthodontists frequently.

PATIENT CONSENT

A parent or guardian provided written consent for the use of the patient's image.

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