CASE REPORT

Presurgical nasal moulding in a neonate with cleft lip

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SUMMARY

The concept of presurgical nasoalveolar moulding (PNM) was developed to improve the aesthetic result of surgically corrected cleft lip. This paper presents the method of fabrication of PNM appliance and the case of a 30-day-old neonate with unilateral cleft lip in whom nasal moulding was performed. Treatment was initiated at 30 days and continued for 60 days after which the surgical correction of cleft lip was performed. Significant improvement in aesthetics and symmetry of the nose was achieved at the end of the treatment.

BACKGROUND

Numerous techniques have been advocated by several authors to align cleft segments in the desired position. McNiel,¹ Georgiade and Latham,² Hotz *et al*³ have proposed methods for alveolar moulding in a cleft palate patient. All of these methods are aimed at correcting only the alveolar cleft, nasal deformity remains the greatest aesthetic challenge.

To improve the aesthetic result of surgically corrected cleft lip, the concept of presurgical nasoalveolar moulding (PNM) was developed. Grayson *et al*,⁴ in 1993, advocated a technique to mould the alveolus, lip and nose in cleft lip and palate cases. Matsuo *et al*,⁵⁻⁷ in their series of research articles, described timing and outcome of the moulding of nasal cartilage.

This article presents the case report of a neonate with cleft lip where nasal moulding was performed, the method of appliance fabrication and analysis of nasal outcome has been elaborated.

CASE PRESENTATION

A 1-month-old child with a cleft lip was referred to our department. The medical history of the child, and parents was unremarkable. Extraoral and intraoral examination of the child revealed unilateral incomplete cleft lip on the left side (figures 1 and 2). Because the child was scheduled for surgery at 3 months, presurgical nasal moulding was planned. The treatment method was explained to the parents and informed consent was obtained.

TREATMENT

A primary impression of the maxillary arch was made with polyvinyl siloxane putty (Aqualis Soft Putty, Dentsply Limited, UK). The impression was filled with plaster of Paris. A special tray was fabricated using self-cure acrylic (RR Cold Cure, DPI,

Figure 1 Preoperative extraoral frontal view.

Mumbai, India) on the poured primary cast. A final mucostatic impression was made using a special tray with alginate impression material (Imprint, DPI, Mumbai, India) and poured with type-III dental stone (figure 3). Since the baby was crying during both the impression making procedures, it was ensured that she faced the floor to make sure that no impression material was ingested. The required amount of alginate material was loaded on the tray and once alginate was set the impression was relieved and removed in a single snap.

Modelling wax was adapted over the final cast. A 5 mm×10 mm cylindrical-shaped wax was attached at a 40° angulation at the anterior aspect of the cast. A 19-gauge stainless steel wire was secured in the wax pattern to fabricate the nasal stent (figure 4). The final wax model was flaked, dewaxed and acrylised using pink heat cure acrylic (RR Heat Cure, DPI, Mumbai, India). Fabrication of nasal stent was performed as described by Grayson and Maull.⁸ Distance between nose and alveolus was measured using dental floss. Length of

Figure 2 Preoperative extraoral basal view.

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Figure 3 (A) Primary siloxane impression of upper arch; (B) primary cast of upper arch for fabrication of special tray; (C) special tray for final impression of upper arch and (D) final working cast.

stainless steel wire was decided accordingly. The R shape was given at the free end of the wire. Dough of cold cure acrylic was placed over the R-shaped stainless steel wire. Shape of the cold cured nasal stent follows the shape of the R-shaped armature (figure 5). After that, the appliance was finished and polished (figure 6).

Figure 4 Wax pattern for presurgical nasoalveolar moulding appliance fabrication.

Half inch diameter red small orthodontic elastic (J J Orthodontics, Chalakudy, Kerala, India) was used for retention of the appliance. First, a half inch width micropore tape was applied to the non-cleft side, then pulled over and adhered to the cleft side to approximate the lip; the philtrum and columella should be brought to the midline. Second, a three-fourth inch width micropore tape was inserted in the elastic and folded on them for both the right and left side. Then elastics were engaged in the groove of the retentive button of the appliance. Before placement of the appliance into the oral cavity denture, relining material was used to shape the nasal stent and help in preventing traumatic ulceration to the nasal cavity and provide the desired moulding for the alar of the nose and enhance the columnar width. After that, the appliance was inserted in the oral cavity and micropore taping was performed on the patient's face (figure 7). This entire procedure was taught to the parents and possible complication was described to them. The patient's parents were instructed to be careful while she is wearing the appliance. The appliance should be placed in cold water whenever the patient is not wearing the appliance. Proper cleanliness of the appliance should be maintained. The patient was placed on regular follow-up with 7–10 days interval for evaluation and adjustment of the nasal stent, if needed. Following completion of nasal moulding at 3 months of age, surgical correction of the cleft lip was performed (figure 8).

OUTCOME AND FOLLOW-UP

During each follow-up visit thorough examination was performed to rule out any complication and on subsequent visits it was found that no complication occurred. The wire component

Figure 5 (A) R-shape bend at end of wire and (B) fabrication of nasal stent with cold cure acrylic.

of the nasal stent was activated with the help of universal orthodontic plier so as to achieve blanching in the alar region of the nose which signifies that the required adjustment is achieved for nasal moulding. No adjustment was required for the palatal part of the appliance. After completion of nasal moulding and surgical correction of the cleft lip a significant improvement

Figure 6 Finished and polished presurgical nasoalveolar moulding appliance.

Figure 7 Appliance in situ (A) frontal view and (B) basal view.

compared with the beginning of the treatment was observed. Williams *et al*⁹ described the method of comparing preoperative and postoperative comparison of nasal changes. In the present case we have calculated and compared the preoperative and postoperative nostril height and width and height of the alar groove. Preoperative nostril height and width ratio of cleft and non-cleft side and height of alar groove ratio were calculated (figure 9). Postoperative nostril height and width ratio of cleft and non-cleft side and height of alar groove ratio were calculated (figure 10). Preoperative and postoperative values are given in table 1.

Figure 8 Postsurgical extraoral view.

Figure 9 Preoperative photographic measurement. (A) Nostril height and width ratio=the nostril height and width ratio on the cleft side (A'/B')/the nostril height and width ratio on the non-cleft side (A/B) (where A=1.27 cm, B=1.48 cm, A'=0.80 cm, B'=2.54 cm). (B) The ratio of the height of the alar groove=the ratio of the height of the top of the alar groove on the cleft side (D'/C')/the ratio of the height of the top of the alar groove on the non-cleft side (D/C) (where C=4.87 cm, D=2.78 cm, C'=5.29 cm, D'=3.15 cm).

This result indicates that the nasal width was decreased, the columellar length was increased and the alar cartilage was moulded to a more normal shape compared with the beginning of treatment.

DISCUSSION

The treatment of nasal moulding follows the principle that if the continuous low-grade pressure is applied it will result in reshaping and recontouring of the nasal cartilage. Alar cartilage

Figure 10 Postoperative photographic measurement. (A) Nostril height and width ratio=the nostril height and width ratio on the cleft side (A'/B')/the nostril height and width ratio on the non-cleft side (A/B) (where A=1.27 cm, B=2.12 cm, A'=0.95 cm, B'=2.33 cm). (B) The ratio of the height of the alar groove=the ratio of the height of the top of the alar groove on the cleft side (D'/C')/the ratio of the height of the top of the alar groove on the non-cleft side (D/C) (where C=5.27 cm, D=3.31 cm, C'=5.27 cm, D'=3.31 cm).

Table 1 Comparison of preoperative and postoperative nostril height and width and height of the alar groove ratio

	Preoperative value	Postoperative value
Ratio of nostril height and width	0.36	0.67
Ratio of alar groove height	1.05	1

is soft, plastic and malleable at birth, so it is mouldable during this period. Hardingham and Muir¹⁰ concluded that malleability of cartilage is because of the high oestrogen concentrations in the newborn's blood during the first 15 days of life. Oestrogen eventually increases the level of hyaluronic acid, which is responsible for increased plasticity in the cartilage.¹⁰ To take the maximum advantage of this property of the cartilage, the nasal moulding should be planned within first 2 weeks of life. In the present case even though the patient reported at 4 weeks of age the treatment was planned so as to take advantage of the available retained elastic property of the nasal cartilage.

Spengler *et al*¹¹ studied the effect of nasoalveolar moulding and found that there was a significant increase in the bi-alar width and the columellar length and width after initiating treatment around 34 days, a similar study was conducted by Ezzat *et al*¹² on the effect of PNM on unilateral cleft lip and palate patients which was initiated at 24 days and for an average 110 days. They concluded that the PNM therapy significantly increases the nasal symmetry by decreasing columellar deviation, increasing nostril height on the affected side, maintaining the bialar width of the nose, increasing columellar width and creating more symmetrical nostril heights and widths. Similarly, equivalent results were achieved in the present case with PNM suggestive of significant improvement in the nasal symmetry and aesthetics after the surgical correction.

Learning points

- Treatment of nasal and alveolar moulding should be started as early as possible, ideally within 15 days of life.
- Regular follow-up (once in 7–10 days) required during the presurgical nasoalveolar moulding (PNM) therapy as nasal stent may require minor adjustment.
- During surgical correction of cleft, surgeon felt ease in approximation and positioning of the muscle compared with children in whom PNM was not performed.
- PNM results in reduced number and cost of revision-surgical procedures for correction of nasal defects.
- After PNM therapy and surgical repair the lip healing is under minimal tension, thereby reducing scar formation.

Contributors All the authors have made an individual contribution to the writing of the article and not just been involved with the patient's care. AD, DS and CSM were involved in the conception and design, acquisition of the data and interpretation. AD and CSM contributed by drafting the article and revising it critically for important intellectual content.

Competing interests None.

Patient consent Obtained.

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