

Nasoalveolar Molding Improves Long-Term Nasal Symmetry in Complete Unilateral Cleft Lip–Cleft Palate Patients

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The surgeon who accepts the responsibility for cleft lip repair also has an obligation to periodically assess the growing child's appearance. In so doing, the surgeon learns from the observations, makes technical adjustments, and, when appropriate, communicates the findings to colleagues. Mirror-image symmetry is the goal of cleft lip and nasal correction. The mind's eye can accurately detect any asymmetry in a repaired unilateral cleft lip as it registers the image of the "normal" contralateral side. Photography is the traditional way to document symmetry: frontal and submental views and a profile when necessary to demonstrate nasolabial protrusion and sagittal relationship. Nevertheless, judging photographs is subjective.

Lord Kelvin exhorted: ". . . when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind."¹ The "curse of Kelvin" was broken for studies of craniofacial morphology by Dr. Leslie Farkas, the father of direct (and indirect) medical anthropometry.^{2,3} Direct anthropometry has its drawbacks. It requires training and experience using the hand-held Vernier caliper and other anthropometric tools. Locating, marking, and measuring standard nasolabial landmarks is demanding in uncooperative children younger than 5 years but easily accomplished in older children. Although direct anthropometry remains the standard technique, indirect anthropometry has many advantages to reverse Kelvin's curse.

Two-dimensional photogrammetry is one version of indirect anthropometry that can be used to measure certain nasolabial dimensions, proportions, and angles.⁴ Some type of calibration must be included in the image. Nevertheless, it suffers from errors in measurement attributable to magnification, parallax, lighting variation, head orientation, and subject-to-camera distance.

Lord Kelvin (Sir William Thomson) would be pleased by the numerical data in this report from the New York University cleft lip unit. They completed the monumental task of making a facial moulage on 25 children, aged 7 to 11 years, with

repaired unilateral complete cleft lip palate. They compared nasal symmetry between those children who underwent preoperative nasoalveolar molding and those who had the same primary nasal repair without molding. Six indirect anthropometric measurements were made on stone casts (made from the facial impressions) based on linear (no mention of whether it was caliper or surface distance) and angular relationships from the basilar and frontal perspectives. The results are given as "normal"-to-cleft side ratios to eliminate variability in the methodologic steps. We are not given the actual measurements. Nevertheless, this study confirmed better symmetry in the nasoalveolar molding group. Curiously, there are no preoperative photographs (to judge severity) or postoperative photographs (to assess nasal symmetry). No type of anthropometry is as critical as the human eye.

Preoperative nasoalveolar molding raises the position of the unilateral cleft-side lower lateral cartilage to a higher step on the staircase of nasal symmetry.⁵ Nevertheless, molding does not excuse the surgeon from the need to position and secure the dislocated and slightly splayed lower lateral cartilage. Technical options to hold the repositioned cartilage include the following: McComb sutures (tie-over bolsters) and transfixion sutures (as described herein). We prefer a semiopen approach through a nostril rim incision and placement of interdomal and intercartilaginous (upper-lower lateral) sutures,⁶ along with insertion of an internal resorbable splint.⁷ Postoperative external nasal splinting is another strategy that deserves mention.

In the study under discussion, columellar deviation was little improved by nasoalveolar molding, but this is not unexpected. Based on Latham's dissections, deviation of the antero-caudal septum is caused by the absence of the septopremaxillary

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Fig. 1. (Left) Image of a 2-month-old boy with left unilateral complete cleft lip–cleft palate before dentofacial orthopedics (Latham device), lip–nasal adhesion, and gingivoperiosteoplasty. (Center) Appearance at age 4 years: frontal 3dMD image following second-stage nasolabial repair illustrates anthropometric points described by Farkas: endocanthion (*en*), alare (*al*), and subalare (*sbal*). (Right) Submental 3dMD image at age 4 years showing Farkas points: pronasale (*prn*), subalare (*sbal*), and subnasale (*sn*).

ligament on the cleft side and the pull from the intact side.⁸ To straighten the antero-caudal septum (and basal columella), the tethering septo-premaxillary ligament on the noncleft side should be incised and the septum straightened and secured to the periosteum of the cleft side of the deviated nasal spine.^{6,9}

The investigators used an accurate (but truly “stone-age”) method of indirect anthropometry. There are several new three-dimensional imaging systems that eliminate certain errors in measurement, especially those caused by parallax and magnification, which occur with two-dimensional representations of three-dimensional surfaces. For example, laser surface scanning is reliable and accurate for identification of nasolabial landmarks.¹⁰ The major drawback is time of image capture (10 to 20 seconds)—far too long for a child to hold still. Stereophotogrammetric systems record images in milliseconds.^{11,12} The 3dMDface System (3dMD, Atlanta, Ga.) and Vectra 3D (Canfield Imaging Systems, Fairfield, N.J.) are composed of synchronized high-resolution digital cameras arranged in a triangulated configuration. Software algorithms merge the different overlapping images into one three-dimensional image that can be reviewed, manipulated, and analyzed on a computer. Standard nasolabial anthropometric points can be easily located on a three-dimensional image; these correlate closely with direct measurements^{13,14} (Fig. 1). The images can be maneuvered in any view for placement of anthropometric points and measure-

ments. As in other indirect anthropometric methods, the data are permanently archived and can be retrieved whenever necessary, permitting interinstitutional studies.

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