Nasolabial Esthetics in Children With Complete Unilateral Cleft Lip and Palate After 1- Versus 3-Stage Treatment Protocols

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Purpose: Facial esthetics play an important role in social interactions. However, children with a repaired complete unilateral cleft lip and palate usually show some disfigurement of the nasolabial area. To date, few studies have assessed the nasolabial appearance after different treatment protocols. The aim of the present study was to compare the nasolabial esthetics after 1- and 3-stage treatment protocols.

Materials and Methods: Four components of the nasolabial appearance (nasal form, nasal deviation, mucocutaneous junction, and profile view) were assessed by 4 raters in 108 consecutively treated children who had undergone either 1-stage closure (Warsaw group, 41 boys and 19 girls, mean age 10.8 years, SD 2.0) or 3-stage (Nijmegen group, 30 boys and 18 girls, mean age 8.9 years, SD 0.7). A 5-grade esthetic index of Asher-McDade was used, in which grade 1 indicates the most esthetic and grade 5 the least esthetic outcome.

Results: The nasal form was judged the least esthetic in both groups and graded 3.1 (SD 1.1) and 3.2 (SD 1.1). The nasal deviation, mucocutaneous junction, and profile view were scored from 2.1 (SD 0.8) to 2.3 (SD 1.0) in both groups. The treatment outcome after the Warsaw and Nijmegen protocols was comparable. Neither overall nor any of the 4 components of the nasolabial appearance showed intercenter differences ($P > .1$).

Conclusions: The nasolabial appearance after the Warsaw (1-stage) and Nijmegen (3-stage) protocols was comparable. The technique of lip repair (triangular flap in Warsaw and Millard rotation advancement in Nijmegen) gave comparable results for the esthetics of the nasolabial area.

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Physical attractiveness plays an important role in the social life and interactions of children, particularly during adolescence.¹ Usually persons who are facially attractive are preferred over unattractive ones. Both adults and children attribute positive qualities and abilities to, and behave more pos-
asymmetry, scarring of the philtral area, or an uneven mucocutaneous junction. These craniofacial impairments can result in negative psychological consequences, ranging from low self-esteem to the risk of social rejection.

One of the goals of the treatment of children with UCLP is to improve their esthetic appearance of structures affected by the cleft. However, the existence of a multitude of treatment protocols implies a lack of agreement regarding their effectiveness and the quality of the produced outcome. Most of the studies that attempted to evaluate the long-term outcomes of treatment of UCLP have focused on cephalometric assessment of the craniofacial morphology or dental arch relationship. The few intercenter investigations of facial esthetics could not identify specific elements of the protocols related to the nasolabial appearance. This might have resulted from the relatively small samples compared or a comparison with the published reports. Therefore, the objective of the present study was to compare the nasolabial esthetics in 2 relatively large groups of consecutive patients who had undergone different treatment protocols.

Materials and Methods

SUBJECTS

The nasolabial appearance was rated on the frontal and profile photographs of 108 consecutively treated children with complete UCLP who were treated in 2 centers (Warsaw and Nijmegen) using 2 different surgical protocols.

A total of 60 patients from the Warsaw Center for Craniofacial Disorders underwent 1-stage repair of all cleft structures. All operations were performed by the same surgeon (Z.D.) according to the following protocol. Lip repair was undertaken by a triangular flap; for hard palate repair, an extended vomer flap with a tight closure of the anterior palate was performed. Soft palate repair was performed by dissection of all abnormal muscle insertions from the posterior margin of the hard palate up to the pterygoid hamuli, which were always fractured; subsequently the palatal muscles were reconstructed and sutured in the midline. No infant orthopedic treatment was performed. The mean age when the 1-stage repair was performed was 9.2 months (SD 2.0; range 6 to 16). The mean age at record taking was 10.8 years (SD 2.0; range 7.4 to 15.1); 68.3% were boys and 31.7% were girls.

A total of 48 children from the Nijmegen Cleft Palate Craniofacial Center underwent 3-stage repair. Lip closure was performed by 2 surgeons according to the Millard rotation-advancement procedure. No primary nose surgery was performed at the lip surgery. The soft palate was closed at 12 to 14 months of age (modified van Langenbeck procedure), and the hard palate was left open to be closed at the age of 9 to 11 years, together with a bone grafting procedure for the alveolar cleft (Boyne and Sands procedure). For patients who were born before 1985, the timing of hard palate closure varied. For the present study, only those patients with a 2-stage palatal closure with closure of the hard palate after the age of 4 years were included. In all patients, infant orthopedics with passive plates, composed of soft and hard acrylic, were used. The plates were maintained until soft palate closure. The mean age at record taking was 8.9 years (SD 0.7; range 7.9 to 10.3); 62.5% were boys and 37.5% were girls.

METHODS

A 5-grade esthetic index was used to assess the morphology of the nasolabial area. In this index, 4 nasolabial components (ie, nasal form, nose deviation, mucocutaneous junction, and profile view) are rated separately on a 5-point scale, in which score 1 corresponds to a very good appearance, score 2 to a good appearance, score 3 to a fair appearance, score 4 to a poor appearance, and score 5 to a very poor appearance. To prevent the observers being influenced by seeing the full face, cropped frontal and profile images of the affected area were used and loaded into PowerPoint (Fig 1). Each slide consisted of the frontal and profile view of 1 patient, with a random number assigned. Four observers (P.F., A.K., C.B., and C.K.) rated all photographs. Before the rating, a calibration exercise was performed, so the raters could familiarize themselves with the rating scale.

To assess intrarater reliability, 10 duplicates of Warsaw and 16 duplicates of Nijmegen patients were
included in a PowerPoint presentation in a random fashion. Thus, a total of 134 slides were shown during the rating session.

STATISTICAL ANALYSIS

The subjective assessment of the esthetics of facial features produces considerable variation among raters.\textsuperscript{5,14} To reduce variability, the scores for the 4 observers can be averaged for each individual nasolabial component, as well as for the sum of the 4 subscores, provided the coherence among the observers is sufficient. Cronbach’s alpha reliability coefficient was calculated for both the individual components and the sum of the subscores to evaluate inter-rater coherence. If the interobserver coherence was adequate, the mean scores of the 4 observers were used in the “Results” section.

The error of measurements for the mean of the panel of raters was calculated according to Dahlberg,\textsuperscript{15} and Spearman’s correlation coefficients were computed to establish the intrarater reliability.

Independent \( t \) tests were used to detect differences for the overall score and subscores between the Nijmegen and Warsaw groups.

Results

RELIABILITY

The method error calculated according to Dahlberg was acceptable and equaled 0.45 for the overall score (range 0.43 for the nasal form to 0.49 for nasal deviation). The correlation between the first and second assessment of 26 duplicated slides was good (Table 1).

Cronbach’s alpha coefficients (Table 2) indicated good reliability for all components of the nasolabial ratings among the 4 observers. The reliability for the overall score among observers was also high (Cronbach’s alpha 0.82). These data imply that the coherence among the observers was satisfactory, and the mean scores of the 4 observers are presented in the “Results” section.

TREATMENT OUTCOME

Table 3 lists the results of the evaluation of the esthetics of the nasolabial area in the Warsaw and Nijmegen groups. Of the 4 components assessed, the nasal form was judged as the least esthetic in both groups (mean score 3.1, SD 1.1, and 3.2, SD 1.1, for the Warsaw and Nijmegen groups, respectively). The nasal deviation, vermilion border, and profile view were judged as relatively more esthetic, and the score ranged from 2.1 (SD 0.8) to 2.3 (SD 1.0) in both groups.

The treatment outcome after the Warsaw and Nijmegen protocols was comparable. Neither the overall nor the 4 evaluated components of the nasolabial appearance showed intercenter differences (\( P > .1 \)).

Discussion

It has been recognized that an assessment of the esthetics of the areas affected by the cleft is subjective and susceptible to a large variation in the scores assigned by different raters.\textsuperscript{10,14,16-18} Many studies have demonstrated relatively low inter-rater agreement when either professional or lay judges have evaluated facial esthetics.\textsuperscript{17,19} Asher-McDade et al\textsuperscript{14} suggested that the reliability of the assessment could be improved by replication of the measurements. The use of a panel of representative judges to generate a single mean score for each case should improve the reliability and remove the interexaminer bias. The mean score can be used, provided the coherence among the raters is substantial (ie, the scores assigned to a group of subjects by the judges are in a similar order). Because the Cronbach’s alpha coefficient of reliability implied adequate coherence,\textsuperscript{11} we used the mean score.

The nasolabial appearance in the Warsaw and Nijmegen groups was similar despite the fundamentally
different treatment protocols in the respective centers. The Warsaw protocol was simple—no infant orthopedics was used and all the cleft structures were repaired during 1 surgical session in the first year of age. The extensive Nijmegen protocol included infant orthopedics with modified Hotz’s acrylic plates and 2-stage palate closure.

Originally, infant orthopedics was introduced as a method to improve the maxillary arch form and the position of the alar base to facilitate surgical repair of the lip and nose.\textsuperscript{20,21} It was assumed that approximation of the alveolar segments before surgery would lead to reduced tension of the repaired lip and, hence, a more favorable outcome.\textsuperscript{22} This concept had a major influence on the treatment of children with UCLP, and many of the European cleft teams adopted various forms of infant orthopedics as a part of their protocols.\textsuperscript{12} However, Prahl et al,\textsuperscript{25} in a randomized clinical trial (Dutchcleft) examined the effects of infant orthopedics on the facial appearance at 18 months of age and did not detect any difference between the children who had and had not undergone infant orthopedics. Nollet et al\textsuperscript{11} compared the nasolabial appearance in prepubertal children from the Nijmegen center and 6 “Eurocleft” centers and concluded that infant orthopedics did not provide a significant benefit for the esthetic ratings compared with centers at which no infant orthopedics was used. Our results suggesting a lack of advantage for infant orthopedics for the esthetics of the nasolabial area also agree with these investigations.\textsuperscript{11,13,25} Therefore, it seems that infant orthopedics does not affect nasolabial esthetics, either in the short or long term.

The techniques of lip repair were different in the Warsaw (triangular flap) and Nijmegen (Millard rotation-advancement) groups. As demonstrated by numerous studies,\textsuperscript{24-26} the shape and symmetry of the nose and lip is disturbed, irrespective of the treatment protocol used. Although Schendel\textsuperscript{27} noted that the surgical technique might affect the position of the scar in the nasolabial area, length of the reconstructed lip, or shape of Cupid’s bow, direct comparisons of the outcome of the triangular flap and rotation-advancement approaches did not bring unequivocal conclusions. Cutting et al\textsuperscript{28} found that the principal difference between the 2 lip repairs was observed in the horizontal dimension of the nose. The position of the alar base was more normal after the Millard rotation-advancement repair, and the triangular flap repair left the alar base laterally displaced. Yamada et al\textsuperscript{29} concluded that the rotation-advancement method produced somewhat better results; notably the shape of the nose and nostril was more favorable. In contrast, Lazarus et al\textsuperscript{30} indicated that the outcome after repair using the rotation-advancement technique tended to result in an unacceptable short lip at the cleft side. Chowdri et al\textsuperscript{31} and Holtmann and Wray,\textsuperscript{32} however, did not observe any major difference in the overall postoperative appearance of lip and nose between the 2 types of repair, except for the greater incidence of hypertrophic scars after the Millard rotation-advancement technique. These contrary findings could have resulted from the varying designs of the studies, which used either objective or subjective methods of assessment of the nasolabial appearance, included children who had had primary repair of the cleft at different ages (range 3 months to 3 years), followed up patients for varying periods (3 months to 18 years postoperatively), or used relatively small samples (10 to 20 patients in many investigations). This could have added to the variability of the outcomes.

The results of the present study imply that the esthetics of the nasolabial area is similar after triangular flap and rotation-advancement approaches. All 4 components (nasal form, nasal deviation, mucocutaneous junction, and profile view) did not demonstrate an intergroup difference. Our results are in accordance with the findings of Chowdri et al,\textsuperscript{31} who compared the nasolabial appearance of 108 children with UCLP who had undergone triangular flap (n = 50; 30 children had a complete cleft) or rotation-advancement repair, and the triangular flap repair left the alar base laterally displaced. Yamada et al\textsuperscript{29} concluded that the rotation-advancement method produced somewhat better results; notably the shape of the nose and nostril was more favorable. In contrast, Lazarus et al\textsuperscript{30} indicated that the outcome after repair using the rotation-advancement technique tended to result in an unacceptable short lip at the cleft side.

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Table 3. COMPARISON OF 4 COMPONENTS AND OVERALL NASOLABIAL APPEARANCE BETWEEN WARSAW AND NIJMEGEN GROUPS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Warsaw</th>
<th>Nijmegen</th>
<th>Difference</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Score (95% CI)</td>
<td>90% Central Range</td>
<td>Score (95% CI)</td>
<td>90% Central Range</td>
</tr>
<tr>
<td>Nasal form</td>
<td>3.1 ± 1.1 (2.96-3.25)</td>
<td>1.5-4.5</td>
<td>3.2 ± 1.1 (3.03-3.34)</td>
<td>1.8-4.7</td>
</tr>
<tr>
<td>Nasal deviation</td>
<td>2.1 ± 0.9 (1.99-2.20)</td>
<td>1-3.5</td>
<td>2.1 ± 0.8 (1.95-2.18)</td>
<td>1.3-5.2</td>
</tr>
<tr>
<td>Mucocutaneous junction</td>
<td>2.1 ± 0.9 (1.95-2.17)</td>
<td>1-3.0</td>
<td>2.2 ± 0.9 (2.05-2.30)</td>
<td>1.3-5</td>
</tr>
<tr>
<td>Profile view</td>
<td>2.3 ± 1.0 (2.22-2.47)</td>
<td>1-3.8</td>
<td>2.3 ± 0.9 (2.13-2.39)</td>
<td>1.3-5.5</td>
</tr>
<tr>
<td>Overall score</td>
<td>2.4 ± 1.1 (2.35-2.48)</td>
<td>1.4-3.3</td>
<td>2.4 ± 1.0 (2.35-2.49)</td>
<td>1.7-5.3</td>
</tr>
</tbody>
</table>

Abbreviation: CI, confidence interval.
Data presented as mean ± SD, unless otherwise noted.

advancement (n = 58; 38 with complete UCLP) lip repair. Although the investigators mentioned a tendency for shortening of the lip after rotation-advancement repair, no statistically significant difference between the groups was found. The relatively worse scores, such as were also reported by Chowdri et al,\textsuperscript{31} for the nasal shape achieved in the Warsaw and Nijmegen children indicate that the nose remains a challenge to the surgeon in cleft lip and palate surgery.

The assessment of the facial esthetics was done using still images, whose limitations have been discussed previously.\textsuperscript{11} Nonetheless, we believe their advantages, such as the case of the collection of standardized pictures and the use of one technique allowing for the comparison of morphologic details captured at varying times, might balance the shortcomings. Although a still image is a 2-dimensional representation of a three-dimensional structure, an agreement between the facial esthetics evaluated directly and indirectly was demonstrated as moderate to good.\textsuperscript{16} Also, a comparison of the measurements of the face performed on live subjects and digital images showed close concordance.\textsuperscript{35} The assessment of the lip and nose esthetics on transparencies was in greater agreement with the clinical evaluation than the nasolabial esthetic evaluation would have produced somewhat better scores. Also, the inclusion of children with Simonart’s bands only into the Warsaw sample might have increased the inequivalence of the 2 groups. The presence of the band implies that the width of the cleft is less than when the band is absent. The long-term effects of Simonart’s band on the nasolabial esthetics are unclear. Semb and Shaw\textsuperscript{54} demonstrated only minimal differences in craniofacial growth between children with and without bands. However, children with bands required fewer secondary revisions of the nose and lip. In contrast, Nollet et al\textsuperscript{11} detected no relationship between the width of the cleft and nasolabial appearance.

On the basis of the results of the present study, the nasolabial appearance after the Warsaw (1-stage) and Nijmegen (3-stage) protocols was similar. Also, the technique of lip repair (triangular flap in Warsaw and Millard rotation-advancement in Nijmegen) did not seem to affect the esthetics of the nasolabial area.

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