

# Anthropometric and aesthetic outcomes for the nasolabial region in 101 consecutive African children with unilateral cleft lip one year after repair using the anatomical subunit approximation technique

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**Abstract.** One hundred and one patients with complete or incomplete cleft lip underwent the anatomical subunit approximation technique for repair. The patients were followed up prospectively for 1 year. The objective of this study was to determine the outcomes for the nasolabial area through anthropometric measurements and assessment of the Asher-McDade Aesthetic Index and Steffensen's criteria at 1 year after surgery. Six assessors (three cleft surgeons and three non-surgeon medical professionals) examined cropped images; reliability was assessed using Cronbach's alpha. The difference in lip length between the healthy and operated sides was 0.61 mm and the difference in nostril diameter was 0.37 mm (differences not significant). The average scar width was  $2.78 \pm 1.35$  mm. Hypertrophic scars were observed in 9.9% of cases. The average Asher-McDade Aesthetic Index rating varied between 1.35 and 1.98 for all parameters. Cronbach's alpha coefficient was 0.83, 0.89, 0.98, and 0.89 for nasal form, nasal symmetry, vermilion border, and nasolabial profile, respectively. Steffensen's criteria rated appearance as 'good' in 69.3% to 91.1% of cases. The anatomical subunit

approximation technique can be performed in Sub-Saharan Africans for all types of unilateral cleft lip. It significantly improves the length of the medial and lateral lips, leaving an acceptable scar. A study with a larger sample size and longer follow-up is warranted.

Key words: unilateral cleft lip repair; anatomical subunit approximation technique; anthropometric outcome; aesthetic outcome.

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Cleft lip and palate (CLP) represents the most common birth defect affecting the head and neck region; the incidence rate is 1 in 700 live births<sup>1</sup>. Orofacial cleft surgery aims to repair and restore the morphological and functional structures of the lip, nose, and palate. The cosmetic appearance is of greatest relevance in lip repair. Repair of the palate is not restricted solely to closure of the cleft, but entails improved function of the secondary palate. Several plastic surgery schedules have been proposed, and most authors recommend lip repair in infants between 3 and 6 months of age in order to restore aesthetic facial symmetry and functional structures<sup>2</sup>. Facial asymmetry greatly impacts the psychological health of patients<sup>3</sup>.

Many surgeons apply the major principles of aesthetic surgery as stated by Gillies<sup>4</sup>, placing emphasis on analysis of the specific deformity, the repair plan, use of wide dissection, and optimal tissue reconstruction. The quality of the final lip scar is affected by the operative technique, marks placed, and orientation of the incision. The incision may be straight or comprise several flaps<sup>5</sup>. The best approach involves orienting the scars along existing anatomical entities<sup>6</sup>.

Millard's techniques are known to result in a shortened lip when used to close wide clefts<sup>7-9</sup>. The Tennison-Randall technique produces a scar that passes through anatomical subunit structures<sup>10</sup>. Fisher has described a technique consisting of 25 landmarks positioned such that the incision passes along the edges of anatomical subunits of the nasolabial area<sup>11</sup>. This technique is considered to be a hybrid technique<sup>12</sup>, and is also termed the anatomical subunit approximation technique.

Hypertrophic scars often produce additional deformation and contractures<sup>13-15</sup>. Wound healing disorders are commonly observed in Sub-Saharan African patients, who are predisposed to hypertrophic and keloid scars following head and neck surgeries<sup>16,17</sup>. However, no data supporting this premise after cleft lip repair when using similar procedures have been reported.

Several rating scales for the assessment of CLP repair have been described. Of these, the most commonly used is the Asher-McDade Aesthetic Index<sup>18-21</sup>.

CLP treatments have been conducted in Lubumbashi via numerous mass campaigns, with various surgical techniques performed according to the experience of each surgeon. However, no longitudinal study on the aesthetic and functional outcomes of patients who have undergone operations by the same surgical team, using the same technique, and involving a Central African population, have been reported to date.

The objective of this study was to determine the outcomes for the nasolabial area at 1 year after the repair of non-syndromic unilateral cleft lip (CL), unilateral cleft lip and alveolus (CLA), or unilateral CLP by means of the anatomical subunit approximation technique in 101 infants in Lubumbashi, DR Congo. The outcomes were determined by performing anthropometric measurements and assessing the Asher-McDade Aesthetic Index and Steffensen's criteria.

## Materials and methods

### Study location and period

A prospective study was performed in the city of Lubumbashi, DR Congo, from July 2012 to July 2016. Three teaching hospitals were involved, namely the University Clinic of Lubumbashi, Jason Sendwe Hospital (a provincial reference hospital), and Polyclinic Medicare. The study was conducted by a team of surgeons from the University of Lubumbashi and two general practitioners. The outcome parameter was scar quality, which was rated as either good or a wound healing disorder. A healing disorder was considered patholog-

ical, whereas normal scarring was considered the normal outcome.

### Patients

The study focused on infants with non-syndromic unilateral CL, unilateral CLA, or unilateral CLP, born in a maternity facility in Lubumbashi health district, who had undergone follow-up by the surgical team since birth or February 2012. All patients included in this study underwent cheilorrhaphy by means of the anatomical subunit approximation technique<sup>11</sup>, under general anaesthesia with orotracheal intubation (Fig. 1). Surgery was performed at between 3 and 8 months of age. Following hospital discharge, all patients underwent regular follow-up every 3 months in order to verify the quality of their scars. They were followed up for 12 months postoperatively. All procedures were performed by the same surgeon and under the same conditions. The protocol and informed consent form were approved by the Medical Ethics Committee of the University of Lubumbashi.

### Study parameters

The following demographic and clinical variables were evaluated: sex, age at surgery, age at last clinical measurement, and body mass index (BMI, kg/m<sup>2</sup>). BMI was classified into two different groups: below or equal to the 50th percentile ( $\leq 50$ th) and above the 50th percentile ( $> 50$ th).

The cleft type was classified as unilateral cleft lip with or without alveolus (CL  $\pm$  A) or unilateral cleft lip and palate (CLP). The affected side (left or right) was recorded.

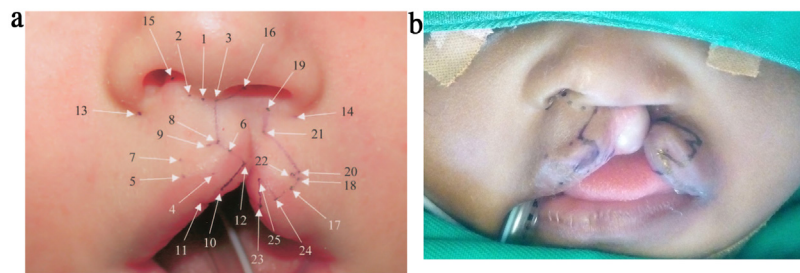


Fig. 1. (a) Landmarks for the Fisher technique or 'anatomical subunit approximation technique'<sup>11</sup>; (b) example of markings made before infiltration and incision.

The scar was classified as a flat scar, contracted scar, hypertrophic scar, or depressed scar. Scar colour was considered normal, hypopigmented, or hyperpigmented, whilst scar flexibility was categorized as firm or soft.

The direction of Cupid's bow was classified as horizontal or oblique. Vermilion was observed to be continuous or discontinuous. The shape of the upper lip was categorized as normal, thick, thin, or exhibiting a notch. Columella could be either not deflected or skewed. The alar dome was indicated to be well-wrapped or flattened. Depending upon the height of the alar base implantation, it was categorized as low or normal.

Three anthropometric parameters for the CL repair were analyzed using a caliper during follow-up, namely the length of the philtrum (comparing the operated side and normal side), scar width, and diameter of the nostril (comparing the operated side and normal side). The triangle width, i.e. the distance between points 18 and 20 in Fig. 1a, was also recorded. As the study subjects were infants, the measurements were taken during deep sleep in order to obtain facial symmetry in the absence of facial muscle movements. This approach was time-consuming due to the necessity to wait for the infant to fall asleep.

A diagnosis of normal wound healing or scar disorder was recorded after evaluation of the aforementioned parameters. The term 'scar disorder' or 'poor scar quality' was used to refer to hypertrophic scars, contracted scars, scar widths exceeding 2 mm, discontinuous vermilion, and scars with an oblique orientation of Cupid's bow. Hypertrophic scars were defined as scars that protruded compared to the normal skin of the upper lip. Contracted scars were defined as scars shorter than the incisions from which they resulted.

### Assessment parameters

Assessment of the cosmetic results was conducted based on the Asher-McDade Aesthetic Index<sup>22,23</sup> and Steffensen's criteria (Table 1)<sup>24,25</sup>. Six assessors, who were not involved in conducting the study, evaluated the results: three were cleft surgeons (group 1) and three were non-surgeon medical professionals (group 2). The surgeons and general practitioners who performed the study did not take part as assessors. The assessment was performed using cropped images obtained 1 year after surgery.

An objective evaluation was performed through physical examination and anthropometric measurements at 1 year after the repair. The consistency of the scar (firm or soft), continuity of the vermilion, orientation of Cupid's bow, and quality of the upper lip (thin, thick, exhibiting a notch, or normal) were examined.

### Statistical evaluation

The reliability of the assessor evaluation by Asher-McDade Aesthetic Index was assessed by means of Cronbach's alpha coefficient and the inter-class and intra-class correlation coefficients. Reliability was considered significant with a Cronbach's alpha value exceeding 0.70. The data were recorded in Microsoft Excel version 10, 2002 (Microsoft, Redmond, WA, USA) and processed using IBM SPSS Statistics for Windows version 24.0 software (IBM Corp., Armonk, NY, USA). For the analysis of variance (ANOVA) test, the difference was considered statistically significant at a *P*-value of <0.05.

### Results

A total 101 subjects were enrolled in this research. The patients underwent surgery

at between 3 and 8 months of age (mean age 6 months). There were more males than females, with a sex ratio of 1.8:1. Unilateral CL ± A was the most commonly observed presentation (89.1%); CLP accounted for 10.9% of cases. The clefts seen in this study displayed a tendency to be more localized on the left side (72.3%). Complete unilateral cleft lip with or without cleft palate (CL/P) was observed in 91 patients (90.1%) and incomplete CL in 10 patients (9.9%). No statistically significant difference was found between complete CL/P and incomplete CL and the quality of the scar at 1 year post-surgery.

Healing disorders were observed in 18.8%, with hypertrophic scars seen in 9.9% (Fig. 2). Most scars displayed a normal colouration; however, nine patients (8.9%) had hypopigmented scars and one patient (1.0%) had a hyperpigmented scar. The scar was soft in 61.4% of cases, whilst 38.6% of scars were firm. The vermilion was continuous in 85.1% of patients. No case of muscular dehiscence occurred. A notch on the lip was observed in 6.9% of the patients who had undergone surgery. Columella was not deflected in 83.2% of patients and was skewed in 16.8%. The alar dome was well wrapped in 81.2% and slightly flattened in 18.8% of cases. The alar base was positioned low in 8.9% of cases and normally in 91.1%. The mean scar width was  $2.78 \pm 1.35$  mm. Overall, 45.5% of scars were less than 2 mm in width and 14.9% exceeded 4 mm. The mean triangle width was 1.5 mm.

The average philtrum length was  $12.87 \pm 2.25$  mm on the healthy side and  $12.26 \pm 2.27$  mm on the operated side. The difference in length was 0.61 mm, whilst Cronbach's alpha was 0.93 (Table 2). The transverse nostril diameter was  $9.87 \pm 2.29$  mm on the

Table 1. Steffensen's criteria.

Structures	Appearance		
	Good	Average	Poor
Alar base	At the same level as the normal side	Difference <1 mm compared to the normal side	Difference >1 mm compared to the normal side
Alar dome	Equal curvature to the normal side		Any depression compared to the normal side
Cupid's bow	Perfect	Distortion on the cleft side of <2 mm	Distortion on the cleft side of >2 mm
Lip length	Equal length on both sides	Shorter than cleft side by >1 mm and <2 mm	Shorter than cleft side by >2 mm
Nostril symmetry	Equal height and width to the normal side	Height or width >1 mm and <2 mm longer than the normal side	Height or width >2 mm longer than the normal side
Scar appearance	No hypertrophy	Hypertrophy with no disturbance of cupid's bow or columella	Hypertrophy with disturbance of cupid's bow or columella
Vermilion border	Perfect	Disparity of <1 mm	Disparity of >1 mm
White roll match	Perfect	Disparity of <1 mm	Disparity of >1 mm



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Fig. 2. Patient outcomes in terms of the scar. Example patient 1: (a) preoperative, (b) immediately postoperative, (c) normal scar on the left side with a discontinuous vermilion. Example patient 2: (d) preoperative, (e) immediately postoperative, (f) hypertrophic scar on the right side.

healthy side and  $10.24 \pm 2.59$  mm on the operated side. The difference was 0.37 mm, whilst Cronbach's alpha was 0.88 (Table 2).

As shown in Table 3, there was no statistically significant difference between the sexes with regard to scar quality at 1 year postoperative. The mean BMI of patients with normal scars was  $18.94 \text{ kg/m}^2$  and of those with healing disorders was  $16.04 \text{ kg/m}^2$ . Most patients with a BMI  $\leq 50$ th percentile had a scar disorder, whereas most patients with a BMI above the 50th percentile had a normal scar; the difference proved to be statistically significant (odds ratio (OR) 28.31, 95% confidence interval (CI) 7.21–111.19,  $P < 0.0001$ ). The average scar width in those with normal scars was

$2.33 \pm 1.13$  mm and in those affected by healing disorders was  $3.51 \pm 1.67$  mm. Scar width ( $>2$  mm vs.  $\leq 2$  mm) was significantly associated with healing disorders (OR 23, 95% CI 2.93–180.53,  $P < 0.0001$ ).

The association between scar consistency and scar quality was statistically significant ( $\chi^2 = 34.08$ ,  $P < 0.0001$ ). Almost all normal scars were flexible, while all poor quality scars were firm. The association between the direction of Cupid's bow and scar quality was statistically significant (OR 12.15, 95% CI 2.69–54.74,  $P = 0.0012$ ). The association between vermilion continuity and scar quality also proved statistically significant (OR 11.4, 95% CI 3.35–38.83,  $P = 0.0001$ ). With regard to the upper lip, there were statisti-

cally significant associations between the presence of a notch (OR 64.29, 95% CI 6.75–612.56,  $P < 0.0001$ ), thick lip (OR 10.71, 95% CI 2.48–46.22,  $P = 0.0029$ ), and thin lip (OR 21.43, 95% CI 1.72–266.96,  $P = 0.0286$ ) and the quality of the scar (Table 3).

Table 4 shows the results of the assessor evaluations according to the Asher-McDade Aesthetic Index. Overall, the shape of the nose was considered 'very good' in 27.2% of cases and 'good' in 54.0%. Nasal symmetry was rated as 'good' in 52.0%, 'very good' in 40.1%, and 'average' in 7.4% of cases. Vermilion was assessed as 'very good' in 66.3% of cases and 'good' in 31.7%. The nasolabial region in profile view was evaluated as 'good' in 75.7% of cases and 'very good' in 17.3%.

Table 5 shows that the Cronbach's alpha coefficient was 0.83, 0.89, 0.98, and 0.89 for nasal form, nasal symmetry, vermilion, and nasolabial profile, respectively.

Figure 3 shows the average values given by the two groups of assessors. These were  $1.92 \pm 0.74$  and  $1.98 \pm 0.76$  for nasal form;  $1.65 \pm 0.66$  and  $1.71 \pm 0.61$  for nasal symmetry;  $1.35 \pm 0.52$  and

Table 2. Reliability of philtrum length and transverse nostril diameter measurements on the normal side and operated side.

	Philtrum length	Transverse diameter of the nostril
Sample size	101	101
Cronbach's alpha	0.93	0.88
Inter-class correlation coefficient	0.87	0.79
Intra-class correlation coefficient	0.93	0.88
95% CI	0.90–0.95	0.82–0.92

CI, confidence interval.

Table 3. Factors associated with healing disorders.

	Healing disorder, <i>n</i>	Normal, <i>n</i>	OR	95% CI	$\chi^2$	<i>P</i> -value
Width of the scar						
>2 mm	18	36	23	2.93–180.53	16.02	<0.0001
≤2 mm	1	46	1			
BMI in kg/m <sup>2</sup>						
≤50th percentile	16	13	28.31	7.21–111.19	35.21	<0.0001
>50th percentile	3	69	1			
Sex						
Male	13	52	1.25	0.43–3.63	0.02	0.4500
Female	6	30	1			
Diagnosis						
CL ± A	18	72	2.5	0.30–20.81	0.22	0.3438
CLP	1	10	1			
Side						
Right	6	22	1.26	0.43–3.72	0.02	0.4400
Left	13	60	1			
Scar consistency						
Firm	19	20	–	–	34.08	<0.0001
Soft	0	62	1			
Cupid's bow						
Oblique	6	3	12.15	2.69–54.74	11.57	0.0012
Horizontal	13	79	1			
Vermilion						
Discontinuous	9	6	11.4	3.35–38.83	16.53	0.0001
Continuous	10	76	1			
Upper lip						
Thick	4	5	10.71	2.48–46.22	10.1	0.0029
Notch	6	1	64.29	6.75–612.56	24.92	<0.0001
Thin	2	1	21.43	1.72–266.96	5.1	0.0286
Normal	7	75	1			

OR, odds ratio; CI, confidence interval; BMI, body mass index; CL ± A, cleft lip with or without alveolus; CLP, cleft lip and palate.

Table 4. Assessor group evaluations according to the Asher-McDade Aesthetic Index.

Asher-McDade Aesthetic Index <sup>a</sup>	Group 1 <sup>b</sup> <i>n</i> (%)	Group 2 <sup>b</sup> <i>n</i> (%)	Combined group results <i>n</i> (%)
Nasal form			
1	29 (28.7)	26 (25.7)	55 (27.2)
2	54 (53.5)	55 (54.5)	109 (54.0)
3	15 (14.8)	16 (15.8)	31 (15.3)
4	3 (3.0)	4 (4.0)	7 (3.5)
5	0 (0)	0 (0)	0 (0)
Nasal symmetry			
1	44 (43.6)	37 (36.6)	81 (40.1)
2	49 (48.5)	56 (55.5)	105 (52.0)
3	7 (6.9)	8 (7.9)	15 (7.4)
4	1 (1.0)	0 (0)	1 (0.5)
5	0 (0)	0 (0)	0 (0)
Vermilion border			
1	68 (67.3)	66 (65.3)	134 (66.3)
2	31 (30.7)	33 (32.7)	64 (31.7)
3	2 (2.0)	2 (2.0)	4 (2.0)
4	0 (0)	0 (0)	0 (0)
5	0 (0)	0 (0)	0 (0)
Nasolabial profile			
1	17 (16.8)	18 (17.8)	35 (17.3)
2	76 (75.2)	77 (76.2)	153 (75.7)
3	8 (7.9)	6 (5.9)	14 (6.9)
4	0 (0)	0 (0)	0 (0)
5	0 (0)	0 (0)	0 (0)

<sup>a</sup> According to the Asher-McDade Aesthetic Index, 1 = very good, 2 = good, 3 = satisfactory, 4 = poor, 5 = very poor<sup>22,23</sup>.

<sup>b</sup> Group 1: three cleft surgeons; group 2: three non-surgeon medical professionals.

1.37 ± 0.52 for vermilion continuity; and 1.91 ± 0.49 and 1.88 ± 0.48 for the profile view of the nasolabial region.

Table 6 shows the evaluation based on Steffensen's criteria. The 'good' rating was given for 91.1% of nostril bases, 81.2% of nasal domes, 89.1% of Cupid's bows, 88.1% of lip lengths, 69.3% of nostril symmetries, 90.1% of scar appearances, 85.1% of vermilion matches, and 81.2% of white roll matches. However, poor results were reported for 18.8% of nasal domes and 19.8% of nostril symmetries.

## Discussion

Orofacial clefts pose real morphological and functional problems. In this study, patients were operated on at a mean age of 6 months. The majority of the study subjects were male. These findings are in line with those of several other studies, which have reported interventions around the age of 6 months and a male predominance<sup>26,27</sup>.

All patients were treated with prophylactic antibiotics during the 5 days of hospitalization in order to prevent infection and dehiscence, which are the early complications reported in the literature<sup>28,29</sup>. No cases of postoperative infection or dehiscence of the surgical wound were observed. Psychological support for the parents and the patient is known to promote good patient reintegration into the family and society. Nevertheless, this multidisciplinary approach often proves difficult to achieve in developing countries due to a lack of adequate equipment, qualified staff for each specialty, and low family income.

The restoration of lip continuity (respecting lip length and symmetry) and proper muscle function, as well as the correction of the nasal dysmorphic features, must be achieved in the first operation<sup>30</sup>. A full understanding of the anatomical aetiological factors related to the occurrence of dysmorphia in the nasolabial region ensures functionality<sup>31</sup>. It is well known that the black African population often develops severe scars that may be hypertrophic or keloid, and this should be taken into account<sup>17,32,33</sup>. Furthermore, it is sensible to perform a technique that adheres to the anatomical structures (or sub-anatomical units) by following their contours.

Fisher's technique (the anatomical subunit approximation technique) was applied to all forms of unilateral CL/P in the series presented here, irrespective of severity. The patients were evaluated

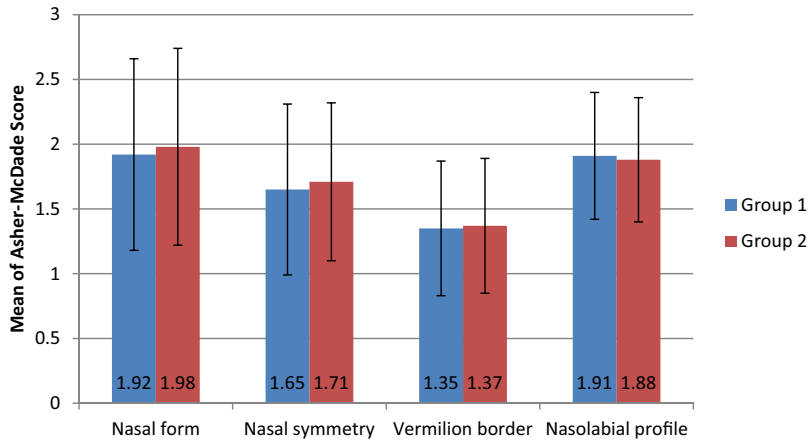


Fig. 3. Mean Asher-McDade Aesthetic Index values for the 101 patients evaluated by assessor groups 1 and 2.

1 year after cheilorrhaphy. Three methods were used to assess the final outcome, namely the objective evaluation of anthropometric parameters, assessment of Steffensen's criteria, and rating based on the Asher-McDade Aesthetic Index by six assessors. A good result was observed in 90.1% of cases; hypertrophic scars were observed in 9.9% of cases. The results of this study are similar to those of Khan et al.<sup>27</sup>, who reported good results with Fisher's technique in 85.4% of cases in their series.

African Americans have been shown to exhibit a 7.1-times greater risk of developing keloids than white Americans after head and neck surgery (ANOVA, OR 7.1, 95% CI 1.3–20.0)<sup>16</sup>. This indicates the need for late evaluation of all surgical patients.

The individual assessment of each patient based on Steffensen's criteria showed that lip length was 'good' in 88.1% of

cases and 'average' in 11.9% of cases. These results are superior to those of Kuna et al.<sup>25</sup>, who reported good results in 66.7% when using the modified Millard technique and 33.3% when using Delaire's technique. Measurement of the distance from the labial commissure to identify Noordhoff's point may lead to the incorporation of deficient tissue during repair<sup>34</sup>. Using the height of the lateral lip may compromise its length<sup>35,36</sup>. Fisher's technique improves the length of the cleft side significantly<sup>11</sup>.

Using the Asher-McDade Aesthetic Index, the average assessor ratings were 'good' to 'very good' for the vermilion and 'good' for the profile view of the nasolabial region, with Cronbach's alpha values of 0.98 and 0.89, respectively. These results are similar to those of Tse and Lien<sup>37</sup>, who reported respective assessments of 'good' to 'very good' (1.2 and 1.3) for vermilion and 'good'

for the profile view of the nasolabial region (1.7 and 1.4). Nonetheless, the present study results differ from and are superior to those of the Americleft study, from five centres, which reported results ranging from 'good enough' to 'good' for both parameters<sup>38</sup>. This may be explained by the difference in operative techniques: their team employed a modified Millard's technique.

The Asher-McDade Aesthetic Index has some limitations, as it does not provide enough detail on some important parameters such as scar characteristics. Several studies have proposed an additional scale to the Asher-McDade Aesthetic Index<sup>39,40</sup>.

Nasal symmetry was rated 'good' to 'very good' by both groups of evaluators based on the Asher-McDade Aesthetic Index. Furthermore, the overall nasal form was assessed as 'good' by the two groups. The reliability of the nasal symmetry and nasal form assessment was verified using Cronbach's alpha, with respective values of 0.89 and 0.83. Inter- and intra-class correlation coefficients proved highly significant for the four parameters. These results are slightly higher than those of Khan et al.<sup>27</sup>, who reported a 57.4% 'good' rate for nasal symmetry by Fisher's technique (the present study found 40.1% of 'very good' symmetry and 52.0% of 'good' symmetry). Nevertheless, Noordhoff's technique yielded significantly more cases of 'good' nasal symmetry than Fisher's technique in their series.

According to the assessment based on Steffensen's criteria, the results of the present study proved slightly better than those of Kuna et al.<sup>25</sup>, who reported 'good' results in 55.6% of cases for white lip when applying the modified Millard's technique, 66.7% for vermilion using Delaire's technique, 66.7% for scar appearance using Delaire's technique, and 77.8% for the alar base using Delaire's technique.

In the assessment of anthropometric parameters, an average difference of 0.61 mm was noted for philtrum length. The difference in transverse diameter of the nostril on the healthy side and operated side was 0.37 mm. Significant reliability was determined regarding the measurements of philtrum length and transverse nostril diameter between the normal side and operated side, with a Cronbach's alpha of 0.93 and 0.88, respectively. These results are similar to those of Mulliken and LaBrie<sup>36</sup>, who reported a difference of 0.7 mm in the comparison of the mean transverse widths of the nasal orifices. However, in their series, the healthy side

Table 5. Reliability of the assessor evaluation by Asher-McDade Aesthetic Index.

	Nasal form	Nasal symmetry	Vermilion	Nasolabial profile
Sample size	101	101	101	101
Cronbach's alpha	0.83	0.89	0.98	0.89
Inter-class correlation coefficient	0.70	0.81	0.96	0.77
Intra-class correlation coefficient	0.83	0.89	0.98	0.87
95% CI	0.74–0.88	0.84–0.93	0.97–0.99	0.80–0.91
Kappa	0.50	0.72	0.96	0.72

CI, confidence interval.

Table 6. Evaluation according to Steffensen's criteria.

Characteristic	Good, n (%)	Average, n (%)	Poor, n (%)
Alar base	92 (91.1)	9 (8.9)	0 (0)
Alar dome	82 (81.2)	0 (0)	19 (18.8)
Cupid's bow	90 (89.1)	11 (10.9)	0 (0)
Lip length	89 (88.1)	12 (11.9)	0 (0)
Nostril symmetry	70 (69.3)	11 (10.9)	20 (19.8)
Scar appearance	91 (90.1)	7 (6.9)	3 (3.0)
Vermilion border	86 (85.1)	14 (13.9)	1 (1.0)
White roll match	82 (81.2)	19 (18.8)	0 (0)



was larger than the operated side. Achieving a good initial rhinoplasty enables the achievement of acceptable nasal symmetry, identifiable by the diameter of the nostrils. An 18.8% rate of slight flattening of the alar dome on the operated side was noted in this series. This strengthens the hypothesis of some authors who advocate the performance of a second rhinoplasty<sup>11</sup>.

In the description of Fisher's anatomical subunit approximation technique, the alar base, nasal sill, and white roll are considered to be entirely distinct anatomical subunits<sup>11,40</sup>. Herein lies the benefit of Fisher's technique, which provides the greatest number of possible equivalent dimensions of anatomical subunits during the intraoperative and immediate postoperative period. It is reported that the immediate postoperative result is predictive of the subsequent appearance of the nasolabial region<sup>35,36,41-43</sup>.

Several studies cited in the literature on the outcome of surgery for CL/P have focused on retrospective data and have evaluated only photographic images<sup>44-46</sup>. Few published studies have evaluated the results of CLP repair via Fisher's technique, combining objective anthropometric assessment and subjective assessments based on the Asher-McDade Aesthetic Index. Furthermore, there appears to have been no assessment of Fisher's technique in Sub-Saharan African infants with a focus on scar quality on the white lip reported to date. Most studies performed in Africa have applied the Millard's, modified Millard's, or Tennison-Randall technique<sup>26,47,48</sup>. The present authors intend to perform further objective evaluations at 5 years postoperative to assess scar evolution and the appearance of the nasolabial region.

In conclusion, the anatomical subunit approximation technique significantly improves the length of the medial and lateral lip and leaves an acceptable scar. This constitutes a good surgical procedure that can be performed in Sub-Saharan Africans for all types of unilateral cleft lip, with good outcomes. A study with a larger sample size and longer follow-up is warranted to provide an improved assessment of the nasolabial region.

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### Competing interests

No competing interests.

### Ethical approval

The protocol and informed consent form were approved by the Medical Ethics Committee of the University of Lubumbashi (CEM-UNILU: UNILU/CEM/015/2012).

### Patient consent

Patient consent was obtained for the publication of all clinical illustrations.

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