Anthropometric Facial Analysis of the African American Woman

Jennifer Parker Porter, MD; Krista L. Olson, MD

Objective: To assess the differences in facial proportions between African American and Caucasian women. Differences within the African American population are sought.

Design: Anthropometric survey.

Participants: Volunteer sample of African American women (N=108), aged 18 through 30 years, with African American parents and no previous facial surgery or trauma.

Intervention: Photographs and 16 standard anthropometric measurements were taken in concordance with the 9 neoclassical canons. Results were compared with the North American white standard and the neoclassical canons, and an intragroup evaluation was performed. One-way analysis of variance, 99.7% confidence intervals, and t tests were used to test differences for significance.

Main Outcome Measures: Anthropometric measures.

Results: Compared with white women, the following measurements were found to be significantly different (P<.003) in African American women: special head height was shorter; forehead height II was longer; nose length was shorter; lower face height was longer; height of the calva was shorter; forehead height I was longer; and ear length was shorter. In addition, most horizontal measures were wider, ie, eye-fissure width, nasal width, mouth width, and facial width. The nose and ear have greater angles of inclination. Of the 9 neoclassical canons, the orbital proportion was found to include the most proportional subjects (30.6%), followed by the nasoaural proportion (13.0%) and the nasofacial proportion (9.3%). Subcategorization based on nasal dorsal height yielded the most significantly different measures.

Conclusions: African American female facial anthropometric measures, especially those of the horizontal dimension, differ significantly from those of young white subjects. The average African American woman does not fit the neoclassical standard of facial proportion.

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Propotional evaluation of the face is used by surgeons during the planning stages of facial plastic surgery. These normal proportions are used to critique the face during consultation for rejuvenative or cosmetic changes. Facial analysis and proportions are well described for North American white subjects. Proportional evaluation of the face stems from the neoclassical canons of facial proportion, developed by artists and anatomists of the 17th and 18th centuries. These canons describe the aesthetic proportional relationships of the face and are the foundation on which modern facial analysis is based.

Often, the African American patient is compared with the white patient when the face is analyzed, despite inherent differences in physical appearance. Furthermore, others have combined the African American patient with various groups denoted by “non-Caucasian” or “ethnic” when facial analysis is discussed. As facial cosmetic surgery is becoming more common among people from various ethnic backgrounds, the concept of a single aesthetic standard of beauty is inadequate.

Several studies have evaluated anthropometric differences between racial groups. Nasal analysis has been examined in both the African American and Latino groups. Facial analysis by means of photogrammetry and anthropometry has also been evaluated in Asian populations. Jeffries et al evaluated the African American face using photogrammetric analysis, an indirect means of measuring the structures of the face. Although anthropometric analysis of the African American and black Carib-
SUBJECTS AND METHODS

One hundred eight African American female volunteers participated in this study, which was approved by our institutional review board. Subjects included in the study were required to be 18 through 30 years of age to minimize the effects of aging on the facial proportions. Other inclusion criteria consisted of both parents of African American heritage, no previous plastic or reconstructive surgery of the face, no major trauma to the face, body mass index (calculated as weight in kilograms divided by the square of height in meters) of no greater than 27, and no history of craniofacial syndromes.

After obtaining informed consent, demographic data were obtained, including age, weight, height, place of birth, and parental heritage. Standard photographs of the face were obtained, including the frontal, right and left lateral, right and left oblique, and base views. Photographs were analyzed for face shape, classification as described by Ofodile et al,1 hereafter referred to as the Ofodile classification, nostril shape, and distinguishing characteristics.

All measurements were obtained by the same investigator (J.P.P.). Surface landmarks were noted on the face before taking standard anthropometric measurements (Figure 1).1 Sixteen standard anthropometric measurements were obtained, including special head height (vertex-endocanthion), special face height (endocanthion-gnathion), forehead height II (trichion-nasion), nose length (nasion-subnasale), lower face height (subnasale-gnathion), height of calva (vertex-trichion), forehead height I (trichion-glabella), special upper face height (glabella-subnasale), ear length (superaurale to subaurale), interocular distance (endocanthion-endocanthion), nose width (alare-alare), eye-fissure width (exocanthion-endocanthion), mouth width (cheilion-cheilion), facial width (zygion-zygion), nasal bridge inclination, and ear inclination. Linear measurements are reported in millimeters, and inclinations are expressed in degrees.

The 9 neoclassical canons of facial proportion were examined, including vertically (canons I-IV) and horizontally (canons V-XIII) oriented measures and angles of inclination (canon IX). The formulas for the 9 canons are as follows: canon I, 2-section facial profile (vertex-endocanthion + endocanthion-gnathion); canon II, 3-section facial profile (trichion-nasion + nasion-subnasale = subnasale-gnathion); canon III, 4-section facial profile (vertex-trichion = trichion-glabella = glabella-subnasale = subnasale-gnathion); canon IV, nasoaural proportion (superaurale-subaurale = nasion-subnasale); canon V, orbito-nasal proportion (endocanthion-endocanthion = alare-alare); canon VI, orbital proportion (exocanthion-endocanthion = endocanthion-endocanthion); canon VII, naso-oral proportion ([alare-alare] × 1.5 = cheilion-cheilion); canon VIII, nasofacial proportion ([zygion-zygion] × 0.25 = alare-alare); and canon IX, nasoaural inclination (nasal bridge inclination = ear inclination).

In addition, the results were compared with the North American Caucasian standard,1 and an intragroup evaluation was performed. Data were entered on spreadsheets and analyzed using commercially available software (SPSS version 8.0; SPSS Inc, Chicago, Ill). We used 99.7% confidence intervals to assess differences between the results of our sample population and those of others; overall chance of type I error is $P < .05$. Differences between subgroup means of our sample population were assessed using t tests and 1-way analysis of variance. Proportional relationships were said to exist if the difference was not greater than 1 mm or 2°.

RESULTS

DEMOGRAPHIC DATA

One hundred twelve African American women were enrolled in the study; of these, 4 were excluded because of failure to meet the inclusion criteria. Two women were excluded because of parental heritage; 1 woman, because of failure to meet the height and weight requirements; and 1 woman, because of auricular deformity. African American women (n = 108) enrolled in the study had an average age of 25.0 years (range, 18-30 years). The average height and weight were 164.6 cm and 62.7 kg, respectively. Most subjects (68.5%) were born in our geographic region (Texas, Louisiana, Arkansas, and Mississippi).

COMPARISON WITH NORTH AMERICAN CAUCASIAN NORMS

The results of the anthropometric measurements are summarized in Table 1. A significant difference existed be-
The special upper facial height exceeded the forehead height and lower facial height in most subjects. The special upper facial height was smaller than the lower facial height in three quarters of the subjects. Nasoaural proportion, as established by neoclassical canon IV, was found in very few subjects. Most subjects had an ear length that was greater than their nasal length (Figure 5). Assessment of orbitonasal proportion (canon V) showed that alar width was rarely equal to or was less than the interocular distance. Most had an alar width of greater than the interocular distance. The differences between these subgroups were a few millimeters. Nasoral proportion (canon VII) was present in very few subjects. In most subjects, 1.5 times the alar width was greater than the mouth width. Evaluation of nasofacial proportion (canon VIII) showed that the alar width was wider.
than one quarter of the facial width in most subjects (Figure 7). Finally, the nasal bridge inclination (canon IX) was greater than the ear inclination in almost all subjects (Figure 8).

SUBCATEGORIZATION

A variety of classification schemes were assigned to each subject to determine whether a classification scheme could be used to subcategorize subjects. The Olodile classifi-
The neoclassical canons were originally formulated by scholars and artists of the Renaissance and were based on classical Greek canons to define the relationships between various areas of the head and face as a guide for artists. The influence of the neoclassical canons, which dominated in the 17th and 18th centuries, diminished by the late 19th century. They remain as the foundation on which modern facial analysis is based. Neoclassical canons I through IV relate to vertically oriented proportions, whereas canons V through VIII deal with horizontal measures. Canon IX relates proportions of the angles of inclination. Comparison of our data with the neoclassical canons reveals that very few African American subjects fit the established proportions. Likewise, young North American Caucasian women rarely fit them. The proportions of our subjects are illustrated in Figures 2 through 8. The illustrations are drawn to scale and are based on the proportions of the average African American woman.

Facial analysis of the African American woman has evolved through several studies. Ofodile and Bokhari conducted an exploratory study that included physical examination, photographs, and anthropometric measurements of the African American nose in 80 men and 121 women ranging in age from 18 to 87 years. They observed that the African American nose could be divided into 3 distinct groups denoted African, Afro-Caucasian, and Afro-Indian. This classification was designed to bring analysis of the face to a preliminary and important step in the approach to the patient who presents for facial plastic and reconstructive surgery. The extensive variability in the human face ensures its individuality. Although the compilation of facial features of African American women is diverse, our study shows that the average young African American female face differs significantly from the North American Caucasian female face. Thirteen of the 16 measures were significantly different from those of the North American Caucasian face. Although the probability of type I error is elevated with repeated measures, the large number of significantly different proportions with an α of .003 suggests that significant differences between the populations exist. Although the special head height was shorter for African American women, the forehead heights I and II were longer and the height of the calva was shorter. Nose length was shorter for African American women, as was ear length. Alar width and eye-fissure width were greater in African American women; however, facial width was not significantly different between groups. The mouth width was greater and ear length was shorter. Although some of these measures have a difference of only 2 mm, the overall composition of the values yields a distinctly different appearance.

Table 3. Low vs High Dorsum in Young African American Women

<table>
<thead>
<tr>
<th>Feature</th>
<th>Low Dorsum</th>
<th>High Dorsum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special face height, mm</td>
<td>101.5</td>
<td>105.0</td>
</tr>
<tr>
<td>Nose length, mm</td>
<td>45.7</td>
<td>49.0</td>
</tr>
<tr>
<td>Forehead height I, mm</td>
<td>53.4</td>
<td>56.5</td>
</tr>
<tr>
<td>Special upper face height, mm</td>
<td>59.3</td>
<td>63.0</td>
</tr>
<tr>
<td>Nasal bridge inclination, degrees</td>
<td>41.5</td>
<td>37.9</td>
</tr>
</tbody>
</table>

COMMENT

Analysis of the face is a preliminary and important step in the approach to the patient who presents for facial plastic and reconstructive surgery. The extensive variability
order to the wide variations of morphologic features and anatomy seen in the African American nose. In that study, 53% of the African noses had a concave dorsum compared with 10% of the Afro-Caucasian and 8% of the Afro-Indian groups. The most common nostril shapes, based on the Farkas classification, were types IV (20%), V (27%), and VI (25%). Anthropometric measurements showed variations according to nasal type, with African noses being the shortest and widest; Afro-Caucasian, the narrowest; and Afro-Indian, the longest. A shortcoming of that study was failure to limit the age range of the subjects. Advanced age causes significant changes in the appearance of the nose, including nasal elongation, tip ptosis, and loss of tip support.15,17 Perhaps the Afro-Indian nose represented an aged Afro-Caucasian subject.

Attempts at subcategorizing our subjects based on the Ofodile classification proved to be difficult, especially when differentiating the Afro-Indian and Afro-Caucasian subtypes. A comparison of the African and Afro-Caucasian subgroups and the African and Afro-Indian subgroups in our study showed that 3 of the anthropometric measures were statistically different. However, a comparison between the Afro-Indian and the Afro-Caucasian subgroups generated no differentiation of the measures. Given the many similarities of Afro-Indian and Afro-Caucasian groups, the potential to combine them exists. Both groups appear to be similar to each other and different from the African group. This finding provides impetus toward developing another means of classification.

In a later study, Ofodile and Bokhari measured 7 variables and calculated 6 area proportion indices related to the nose. Comparisons were made with anthropometric measurements by Farkas1 for the North American adult population. Comparison confirmed that the African American nose was wider than the white nose, with a mean value of 40 mm for African American women compared with 34.7 mm for white women. Our study supports this finding, with alar width being greater in African American women compared with the North American white norm (P < .003).

As previously mentioned, photogrammetric analysis is less accurate than anthropometric analysis.18 Nonetheless, Jeffries et al10 photogrammetrically examined 200 African American subjects (100 male and 100 female) aged 18 through 35 years. Computer analysis of the photographs was performed, and the results were compared with those of Farkas.1 They determined that African American and white subjects had similar vertical facial proportions; however, the horizontal proportions varied significantly. The African American nose was shorter than the white nose. The horizontal dimensions (interocular distance, nose width, mouth width, and facial width) showed many differences between races, including 97% of the study group exhibiting a nose that was wider than the interocular distance compared with 40.8% of white subjects who had a nose that was the same size as the interocular distance. Jeffries and colleagues10 conclude that these findings are in agreement with previously published data. However, they note that there are inherent problems with measurements taken in this indirect manner. Our study found similar relationships.

Obviously, the African American population is diverse in appearance and background. As Ofodile et al and Ofodile and Bokhari have suggested, subpopulations tend to emerge. Our subjects were assigned to subcategories based on facial shape, nostril type, and width of the nasal tip. We could not differentiate subjects based on division into these subgroups.

We propose a new classification scheme based on profile evaluation of the nose: high vs low nasal dorsum. This categorization system is straightforward and allows subjects to be separated easily into 2 groups. Comparison of the anthropometric measures taken in these 2 groups yielded the following 5 measures that were significantly different: special face height, nose length, forehead height, special upper face height, and nasal bridge inclination. Further evaluation is under way to determine if there are other characteristics that may more reliably categorize the African American face.

When our results are compared with an anthropometric analysis of 50 young African American women,11 we find 11 of the 16 measures to be different. In addition, 14 of the 16 measures differ on comparison of the Farkas African American and North American Caucasian populations (P < .05). Perhaps regional variation may account for these differences seen in our subjects and the subjects examined by Farkas in the Northeast portion of the United States. In addition, our study did not include persons of Caribbean descent. However, similar relationships were found for both groups, ie, the African American forehead height I for both populations was greater than the North American white forehead height I.

CONCLUSIONS

Anthropometric analysis of the African American female face suggests differences compared with the North American white face. Thus, a single aesthetic ideal is inadequate. In addition, the African American woman does not fit the neoclassical canons of facial proportion. It appears that the horizontal measures have the most difference, in particular the nasal measure. The use of previous classification schemes in our subject population did not reveal significant differences. Basic groundwork has been laid for analyzing the African American face. Use of the classification scheme high vs low nasal dorsum may help to subcategorize the African American face into subgroups. Additional studies are needed to further define a method of analysis.

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Corresponding author and reprints: Jennifer Parker Porter, MD, Bobby R. Alford Department of Otorhinolaryngology and Communicative Sciences, Baylor College of Medicine, One Baylor Plaza, SM 1727, Houston, TX 77030.
REFERENCES


Quotable

Discourage litigation. Persuade your neighbors to compromise whenever you can. Point out to them how the nominal winner is often a real loser—in fees, expenses, and waste of time. As peacemaker the lawyer has superior opportunity of being a good man. There will still be business enough.

Never stir up litigation. A worse man can scarcely be found than one who does this. . . . A moral tone ought to be infused into the profession which should drive such men out of it.

Abraham Lincoln
“Notes for a Law Lecture”
in Selected Speeches, Messages, and Letters