Wylie-Johnson analysis of adolescents of Afro-Brazilian descent with normal occlusion: investigation of the mean values

Análise de Wylie-Johnson em melanodermas com oclusão normal: determinação dos valores médios

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Objective
The purpose of this study was to evaluate mean cephalometric measurements for a group of individuals of Afro-Brazilian descent using the Wylie-Johnson analysis, and to investigate the presence of sexual dimorphism.

Methods
Thirty-six lateral radiographs of the head of African-Brazilians were used. Subjects were 10 to 14 years old and had clinically normal occlusion, all permanent teeth, and no history of orthodontic treatment.

Results
Results for girls and boys were, respectively: SNA = 88.31º and 89.68º; SNB = 83.96º and 85.01º; ANB = 4.44º and 4.69º; T1 = 118.18º and 116.51º; FG-ST = 16.47 mm and 16.12 mm; ST-Pmf = 19.69 mm and 19.88 mm; Pmf-ANS = 53.69 mm and 54.84 mm; Pmf-1ºMS = 21.83 mm and 20.64 mm; FG-Pg = 108.19 mm and 108.45 mm; FPL –MPL = 27.48º and 27.65º; TAFH = 111.06 mm and 112.26 mm; UAFH = 45.26 mm and 45.38 mm; AFAT = 111.06 mm and 112.26 mm; Con-Go = 51.89 mm and 53.70 mm; gonial angle = 129.27º and 129.28º. Results of Student’s-t test (α = 5%) did not show any sexual dimorphism. Results of descriptive statistics were similar for the individuals of Afro-Brazilian descent in the study.

Conclusion
Individuals of African descent had bimaxillary protrusion, a more acute interincisal angle, a larger inferior facial height, and a markedly convex profile.


RESUMO
Objetivo
Avaliar as medidas cefalométricas médias para um grupo de indivíduos melanodermas usando a análise de Wylie & Johnson e também investigar a presença de dimorfismo sexual.

Métodos
Foram usadas 36 telerradiografias em norma lateral de indivíduos melanodermas, entre 10 e 14 anos de idade, com oclusão clinicamente normal, todos os dentes permanentes e sem histórico de tratamento ortodontico.

Resultados
Os resultados para os sexos feminino e masculino foram respectivamente: SNA = 88.31º e 89.68º; SNB = 83.96º e 85.01º; ANB = 4.44º e 4.69º; T1 = 118.18º e 116.51º; FG-ST = 16.47 mm e 16.12 mm; ST-Pmf = 19.69 mm e 19.88 mm; Pmf-ANS = 53.69 mm e 54.84 mm; Pmf-1ºMS = 21.83 mm e 20.64 mm; FG-Pg = 108.19 mm e 108.45 mm; FPL –MPL = 27.48º e 27.65º; TAFH = 111.06 mm e 112.26 mm; UAFH = 45.26 mm e 45.38 mm; AFAT = 111.06 mm e 112.26 mm; Con-Go = 51.89 mm e 53.70 mm; Gon = 129.27º e 129.38º. A análise estatística descritiva dos dados mostrou homogeneidade entre os mesmos. Não foi observado dimorfismo sexual (teste t de Student, α = 5%).

Conclusão
Os dados sugerem que os indivíduos melanodermas estudados apresentam biprotrusão maxilar, ângulo interincisal mais agudo, altura facial inferior maior e perfil convexo acentuado.


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INTRODUCTION

The concern about taking measurements of the head for anthropological purposes dates back to the mid-eighteenth century. The orthodontic diagnosis and treatment plan were prepared using only plaster casts and craniometric methods. Due to the low precision of these methods in analysis of the patient, many researchers sought means that would allow measurements in patients with the same facility as they were performed in dry skulls.

Broadbent recommended a method that made it possible to obtain successive, standardized radiographs of the head; that is, teleradiographs, enabling the professional to detect the alterations caused by growth and/or orthodontic treatment. In the same year, Hofrath also presented a technique for obtaining standardized radiographs. Interpretation of the tracings in a teleradiograph by cephalometry, a technique that enables craniofacial evaluation by means of radiographs taken within a constant pattern, opened up new horizons for Orthodontics.

Brodie presented a study based on the collection of Broadbent cephalometric radiographs to study the craniofacial growth of children from the age of three months to eight years of age with Downs, and presented one of the first cephalometric analyses effectively used in the diagnosis and planning of orthodontic cases.

According to Krogman with the passing years, cephalometric analyses appeared, which were for the purpose of defining parameters of normality for a certain population group. These analyses provide angular and linear measurements of Caucasian individuals, with normal occlusion and satisfactory facial esthetics, and are useful guides in the preparation of orthodontic diagnosis and treatment plan. However, the values found for the different populations are not the same, as there are racial, ethnic and age-related factors that make them valid exclusively for the studied group in particular.

The cephalometric analysis proposed by Wylie & Johnson was applied in the selected teleradiographs for evaluation of antero-posterior dysplasia (Figure 1), vertical dysplasia (Figure 2) and some of the variables from the analysis of Steiner (SNA, SNB, ANB and the interincisal angle), and verify the presence of sexual dimorphism.

METHODS

As the sample for the study, radiographs in lateral norm were used, obtained from the record charts of the Scientific Documentation Center of the Post-Graduate Course in Dentistry, Piracicaba Dental School, State University of Campinas. The criteria for inclusion in the study were: Stage of mixed or permanent dentition, descendants of Afro-Brazilian parents and grandparents, of both genders, aged between 10 and 14 years, molars in Angle’s Class I, canines in normal key of occlusion, and coincident midline. The following exclusion criteria were considered: History of orthodontic and/or orthopedic treatment, absence of teeth, crowding or girotions, deleterious oral habits, and facial or dental asymmetry.

The cephalometric analysis proposed by Wylie & Johnson was applied in the selected teleradiographs for evaluation of antero-posterior dysplasia (Figure 1), vertical dysplasia (Figure 2) and some of the variables from the analysis of Steiner, (Figure 3). The tracings were performed twice by one and the same operator, with an interval of 10 days between tracings. The results obtained were submitted to descriptive analysis for determination of the means, standard-deviations and maximum and minimum values; and to the Student’s t test at a level of significance of 0.05%, to compare the differences between genders.

This study was approved by the Research Ethics Committee of the São Leopoldo Mandic Dental School, Protocol No.821, in accordance with the Ministry of Health Resolution 196/1996.
RESULTS

Based on the inclusion and exclusion criteria, 36 teleradiographs were selected, of which 20 were of individuals of the female gender and 16 of the male gender. The operator error, according to the repeatability and reproducibility analysis (Gage R&R), ranged between 1.96% and 7.25%, below the ideal tolerance limit of 10%. The Student’s-t test for two samples was used to verify the presence of sexual dimorphism and revealed that the means of the two genders did not differ statistically between them (Table 1).

Table 1. Means ± standard deviation and test for verifying presence of sexual dimorphism.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Caucasian</th>
<th>Afro-Brazilian descendant</th>
<th>Afro-Brazilian descendant</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female gender</td>
<td>Male gender</td>
<td>Female gender</td>
<td>Male gender</td>
</tr>
<tr>
<td>SNA (°)</td>
<td>82.00 ± 2.00</td>
<td>88.31 ± 4.38</td>
<td>89.68 ± 4.79 (81.25 a 97.50)</td>
<td>0.378</td>
</tr>
<tr>
<td>SNB (°)</td>
<td>80.00 ± 2.00</td>
<td>83.96 ± 3.77</td>
<td>85.01 ± 3.96</td>
<td>0.424</td>
</tr>
<tr>
<td>ANB (°)</td>
<td>2.00 ± 2.00</td>
<td>4.44 ± 2.31</td>
<td>4.69 ± 2.62</td>
<td>0.763</td>
</tr>
<tr>
<td>△ 1 (°)</td>
<td>130.00</td>
<td>118.8 ± 8.84</td>
<td>116.51 ± 8.84</td>
<td>0.538</td>
</tr>
<tr>
<td>FG-ST (mm)</td>
<td>17.00</td>
<td>16.47 ± 3.55</td>
<td>16.12 ± 3.00</td>
<td>0.754</td>
</tr>
<tr>
<td>ST-Fpm (mm)</td>
<td>17.00</td>
<td>19.69 ± 1.95</td>
<td>19.88 ± 2.30</td>
<td>0.785</td>
</tr>
<tr>
<td>Fpm-Spna (mm)</td>
<td>52.00</td>
<td>53.69 ± 2.62</td>
<td>54.84 ± 3.38</td>
<td>0.251</td>
</tr>
<tr>
<td>Fpm-L (mm)</td>
<td>16.00</td>
<td>21.83 ± 3.00</td>
<td>20.64 ± 4.11</td>
<td>0.325</td>
</tr>
<tr>
<td>FG-Pg (mm)</td>
<td>100.00</td>
<td>108.19 ± 6.02</td>
<td>108.45 ± 3.90</td>
<td>0.883</td>
</tr>
<tr>
<td>RGFPM (mm)</td>
<td>25.00</td>
<td>27.48 ± 5.09</td>
<td>27.65 ± 5.75</td>
<td>0.927</td>
</tr>
<tr>
<td>AFAT (mm)</td>
<td>113.02 ± 0.67</td>
<td>111.06 ± 5.56</td>
<td>112.26 ± 7.37</td>
<td>0.581</td>
</tr>
<tr>
<td>AFAS (mm)</td>
<td>50.65 ± 0.38</td>
<td>45.26 ± 3.74</td>
<td>45.38 ± 3.30</td>
<td>0.916</td>
</tr>
<tr>
<td>AFAI (mm)</td>
<td>62.37</td>
<td>65.80 ± 3.37</td>
<td>66.88 ± 5.34</td>
<td>0.484</td>
</tr>
<tr>
<td>FG-PF (mm)</td>
<td>0.54 ± 0.38</td>
<td>-1.06 ± 1.485</td>
<td>-2.08 ± 1.905</td>
<td>0.080</td>
</tr>
<tr>
<td>Go-Me (mm)</td>
<td>67.30 ± 0.46</td>
<td>70.24 ± 4.50</td>
<td>69.67 ± 3.68</td>
<td>0.687</td>
</tr>
<tr>
<td>Con-Go (mm)</td>
<td>54.81 ± 0.56</td>
<td>51.89 ± 4.61</td>
<td>53.70 ± 3.26</td>
<td>0.687</td>
</tr>
<tr>
<td>Con-GoMe (°)</td>
<td>122.49 ± 0.71</td>
<td>129.27 ± 4.08</td>
<td>129.38 ± 4.49</td>
<td>0.941</td>
</tr>
</tbody>
</table>

p-values lower than 0.5 indicate statistically significant difference.

DISCUSSION

The different cephalometric analyses used at present were established up to the middle of the Twentieth Century and the values of normality recommended were obtained from a casuistic of Caucasians. However, there was evident need to know the alterations in the linear and angular measurements of the dento-skeletal structures during growth, in addition to establishing their values in the different ethnic groups.9-15

In Individuals of Afro-Brazilian descent there are few studies that have been concerned with the
cephalometric evaluation of this ethnic group in Brazil, with the outstanding studies being those of Silva, Moraes et al., Araújo & Sakima, Fortes, Henriques & Freitas, Silva & Oliveira, Nouer et al., Magnani et al, de Freitas et al., Janson et al., Sobreira et al. and Carvalho et al.

When using certain cephalometric points in evaluating the balance of the facial segments, Wylie & Johnson eliminated the errors of evaluating isolated variables. However, there were no studies about their application in Individuals of Afro-Brazilian descent, which motivated the present study.

Initially, the statistical test for evaluating sexual dimorphism revealed that there were no differences between the genders.

The value found in the relationship of the maxilla with the base of the skull (SNA) showed similarity to the results found by Silva, Fonseca & Klein, Moraes et al., Araújo & Sakima and Bailey & Taylor. D’Aloísio & Pangrasio-Kulbersh found higher values in the male gender than those found in the present study, whereas Janson et al. found lower values for both genders, since in his study no statistically significant difference was found for the male and female genders.

For the relationship of the mandible with the base of the skull (SNB), the results found in both genders were similar to those found by Silva, Fonseca & Klein, Moraes et al. and Araújo & Sakima. In the study of D’Aloísio & Pangrazio-Kulbersh only the values for the female gender were shown to be similar to those of the present study, while the values for the male gender differed only from those in the study of D’Aloísio & Pangrazio-Kulbersh.

In the maxillo-mandibular relationship (ANB) there was similarity of the results with those of Silva, Fonseca & Klein, Moraes et al., Araújo & Sakima, D’Aloísio & Pangrazio-Kulbersh and Bailey & Taylor. In the studies of Fonseca & Klein and Moraes et al., there was agreement of values only in the female gender.

The interincisal angle values were close to those of Bailey & Taylor in both genders, and showed similarity to those of Fonseca & Klein only in the female gender.

The variable that relates the glenoid cavity to the base of the skull (FG-ST) presented a lower value than that suggested by Wylie & Johnson, as it was an indication of mandibular prognathism, characteristic of this ethnic group. The antero-posterior measurement of this casuistic of Individuals of Afro-Brazilian descent; that is, the relationship of the maxilla with the base of the skull (ST-Fpm), position of the first molar with the maxilla (Fpm-6), size of the mandible (FG-ST) and maxilla (Fpm-Spna) were shown to be larger than the standard values proposed by Wylie & Johnson, indicating a more protruded maxilla and mandible in relation to the base of the skull. Silva found a value for length of the mandible similar to that presented in the present study, however, his finding for the size of the maxilla was slightly smaller.

In the vertical dimensions, vertical dysplasia of which the main indicator is the inclination of the mandibular plane (FG-Pg), the total (AFAT), superior (AFAS) and inferior (AFAI) facial heights were observed. The total facial height value (AFAT) was similar to that found by Silva and smaller than that suggested by Wylie & Johnson. Moreover, the superior facial height (AFAS) was smaller, and the inferior (AFAI) was larger than that proposed by Wylie & Johnson. In the angle of the Frankfurt plane with the mandibular plane (PlF.PI), the value found was higher than the standard value of Wylie & Johnson, showing vertical dysplasia.

In the relationship of the glenoid cavity with the Frankfurt plane (FG-PI) the distance found was longer than that proposed by Wylie & Johnson, suggesting a more antero-inferior mandibular position. The mandibular ramus height (Con-Go) in this sample presented a lower value, and the length of the mandibular body and gonion angle (Con-GoMe) showed higher values than those of Wylie & Johnson.

CONCLUSION

The values for Individuals of Afro-Brazilian descent were higher when compared with those established, taking the values for Caucasians as reference. No sexual dimorphism was found in the individuals of Afro-Brazilian descent in the present sample, analyzed by the Wylie-Johnson cephalogram.

From the foregoing, it was concluded that the standards and patterns of one ethnic group cannot be used without modifications for another group, especially Individuals of Afro-Brazilian descent who must have their own measurements.

Collaborators

L LORENZI participated in the elaboration and development of the research, and writing the article. PRA NOUER participated in guiding the research and in writing the article. IU GARBUI, DF NOUER, V FONTANELLA and N PADILHA participated in writing the article.
REFERENCES


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