EVALUATION OF THE BOLTON RATIOS ON 3D DENTAL CASTS OF BRAZILIANS WITH NATURAL, NORMAL OCCLUSIONS

Aim: To evaluate the Bolton ratios in Brazilians with natural, normal occlusions. Methods: Thirty-five dental casts of Brazilian Caucasians with a natural, normal occlusion from the files of the Postgraduate Program in Orthodontics of the Methodist University of São Paulo were scanned in three dimensions. On the scanned images, the greatest mesiodistal distance of each tooth from right first molar to left first molar was measured with Geomagic Studio 5 software. The Bolton ratios were then calculated. Results: The anterior ratio amounted to 78.66% (SD ± 2.72) and the total ratio to 91.58% (SD ± 2.20). Conclusion: The anterior, but not the overall, ratio was significantly different from the ratio suggested by Bolton. World J Orthod 2010;11:67–70.

Key words: Bolton ratios, tooth size relationship, mesiodistal tooth width, 3D scan, occlusion

1MS Student, Department of Orthodontics, Methodist University of São Paulo, São Paulo, Brazil.
2Specialist in Maxillofacial Surgery and Traumatology, Face Hospital, São Paulo, Brazil.
3Professor and Coordinator, Department of Orthodontics, Methodist University of São Paulo, São Paulo, Brazil.
4Professor, Department of Orthodontics, Methodist University of São Paulo, São Paulo, Brazil.

CORRESPONDENCE
Dr Danilo Furquim Siqueira
Rua Costa Aguiar, 875, ap 111
Ipiranga, São Paulo, SP
Brasil
CEP 04204-000
Email: danilosiqueira@odontista.com.br

T he ideal proportions between the maxillary and mandibular teeth allow for finished orthodontic treatments with a proper occlusion, overjet, and overbite. Bolton ratios4,5 or occlusograms3 can indicate whether the size of the teeth in both arches matches one another. In general, tooth size is influenced by genetic factors.4 Differences in tooth size between sexes are small, and there is no significant diversity in tooth size in patients with a Class II, Class III, or normal occlusion.4,5

The Bolton analysis can be performed on plaster casts or digital models using mechanical or digital sliding calipers or specialized software.7–10 In any case, digital models and software are effective and efficacious for evaluations.11–14

This study determined Bolton tooth size ratios on 3D dental casts of Brazilians with natural, normal occlusions to find out whether these indices would be similar to the ones reported by Bolton.

MATERIAL AND METHODS

Out of a total of 6,118, 35 (8 males, 27 females) Caucasian school students between 12 and 21 years of age (mean age 16.03 years) were selected. They presented with Andrews’ six keys15 and had no previous orthodontic treatment.

Their dental casts were scanned with a minimum accuracy of 50 μ (3shape D-250). With the Geomagic Studio 5 software (Geomagic), one operator (R.P.J) measured the greatest mesiodistal distance of each tooth from right first molar to left first molar in both dental arches as described by Bolton.1,2 The anterior teeth were measured on the buccal aspect (Fig 1); the posterior teeth were measured on the occlusal aspects (Fig 2).
Statistical analysis

The anterior and overall ratios were calculated and compared to the original Bolton values with the nonpaired Student t test. The level of significance was set at \( P < .05 \).

After a 15-day interval, seven models were remeasured to evaluate the reliability of the measurement method. Systematic error\(^6\) was calculated by the paired Student t test with a level of significance of \( P < .05 \).

RESULTS

The overall and anterior Bolton ratios are found in Table 1. A significant difference existed for only the anterior Bolton ratio.

Table 2 presents the results of the measurement error for the individual teeth. Only three of the 24 teeth measured demonstrated a significant difference (\( P < .05 \)); thus, the employed method could be viewed as reliable and accurate.

DISCUSSION

Both the present sample and the populations investigated by Heusdens et al\(^1\) had similar values for the overall Bolton ratio. Conversely, the anterior ratio of the present sample (78.66%, SD ± 2.72) and that of Heusdens et al\(^1\) (78.9%, SD ± 2.73) differed significantly from Bolton’s value. However, it should be kept in mind that although the difference is statistically significant, the clinical relevance is very limited. Smith et al\(^1\) questioned the application of this index in populations other than North American Caucasians, and even then, it seemed more applicable for females than males. Therefore, the oclusogram is a superior diagnostic tool because it is adjusted to every single patient.
The results of this study can be considered highly accurate because the data derived from equipment that controlled distortion during image acquisition was more precise (at least 50 μ) compared to other investigations. The software allowed reliable and compatible measurements in comparison with those attained via more conventional gauges.

CONCLUSIONS

In the present sample, the anterior tooth size ratio differed significantly from the value reported by Bolton. However, no significant difference was found for the overall ratio between this sample and the one studied by Bolton.

REFERENCES


![Table 2](image-url)