Original Article

TOOTH SIZE DISCREPANCIES IN INDIVIDUALS PRESENTING WITH DIFFERENT MALOCCLUSIONS

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Abstract

Introduction: The purpose of this study was to identify the differences in anterior and overall tooth size ratios of subjects with Angle's Class I and Class II Division 1 malocclusion groups in North Indian (Punjab) population.
Materials and Methods: This study was performed using measurement on dental casts of 60 normal occlusion (30 males and 30 females , mean age: 20.2 years) and 60 Class II division 1 (30 males and 30 females, mean age: 20.3 years) malocclusion subjects. The mesiodistal width from first molar to first molar was measured on each pretreatment cast to the nearest 0.01 mm using digital calipers, and the anterior and overall ratios were calculated. Student's t-test was performed for statistical analysis.
Results: No statistically significant difference was found in the anterior or overall ratios for males. Slightly statistically significant difference was found in the anterior ratio for females.
Bolton's values can be used with confidence in North Indian (Punjab) population.

Key words
Bolton's values, Tooth-size Ratio, Class I and Class II Division 1 Malocclusion

INTRODUCTION

Arch size and shape affect the stability of the dentition and play an important role in diagnosis and treatment planning. In the last few years great development has taken place as the dental casts are now digitized and can be stored indefinitely. Further, they are used to determine interarch tooth-size discrepancy for various groups of malocclusion and are helpful in planning treatment accordingly.
Bolton's1 anterior and overall tooth size ratios have been accepted as essential diagnostic criteria in orthodontics since Bolton published his tooth size studies. Bolton established ideal anterior and overall ratios with mean values of 77.2% and 91.3%, respectively, for proper harmony of maxillary and mandibular teeth.
Many studies have been done in this regard and dates back to more than a century1,2,3. Moyers and colleagues4 established normative data for the dentition of North American white subjects. Lavell5 concluded that Negroids had greater overall and anterior ratios than Caucasoids and Mongoloids, and that the overall ratio was consistently greater in males than in females, regardless of racial origin. Smith et al6 reported that Bolton's ratios were only applicable to white females and cannot be applied to white males, blacks, or Hispanics. Also, the overall ratio was significantly larger in males than in females.
Nie and Lin7 found significant differences in the anterior and overall ratios between the malocclusion groups in a Chinese population, the ratios showed that the order was Class III followed by Class I and Class II. Ta et al8 reported that although the anterior ratios showed no significant differences among Class I, Class II, and Class III malocclusion groups in a Hong Kong population, the overall ratios were significantly greater in Class III than Class II malocclusion groups. Fattahi et al9 showed that the anterior ratio of the Class III group was significantly greater than those of Class II division 1 and Class II division 2 groups in an Iranian population, and that the overall ratio of the Class III group was significantly greater than the other groups. However, some studies have demonstrated no significant differences in tooth size ratios among different Angle malocclusion groups in different populations.
A PubMed search in July 2007 with the search subject ''tooth size discrepancy'' found no English references available regarding the association between Bolton's tooth size ratios and malocclusions in a Japanese population.
The objective of this study was to identify possible differences in anterior and overall tooth size ratios of subjects with Angle Class I and Class II division1 malocclusion groups in North Indian (Punjab) population

MATERIALS AND METHODS

The sample for this study consisted of 120 subjects subdivided into two types of malocclusion. All the subjects were homogeneous North Indian (Punjab) population. The subjects with varying malocclusions were selected retrospectively from a list of orthodontic patients who had received treatment at Dasmesh Institute of Research and Dental Sciences, Faridkot. They fell into any one of the three malocclusion groups and met the selection criteria of the casts as described later. The two malocclusion groups were Class I malocclusion and Class II division1 malocclusion. Class I malocclusion and Class II division1 malocclusion groups consisted of 30 males and 30 females each, aged between 18 – 25

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years (mean age – 20.2 and 20.3 years respectively). The selection criteria of the casts in the malocclusion groups were as follows:
(1) a fully erupted permanent dentition with only the third molars being absent; (2) good-quality pretreatment casts; (3) no tooth agenesis or extractions; (4) no mesiodistal restorations or abrasion; and (5) no tooth anomalies.
Digital calipers were used to measure the mesiodistal widths from first molar to first molar to the nearest 0.01 mm. The mesiodistal width of each tooth was measured at the greatest distance between the contact points on the proximal surfaces. All the measurements were done by one investigator. A single investigator measured each arch twice, from right first molar to left first molar. If the second measurement differed by more than 0.2 mm from the first measurement, the tooth was remeasured. The anterior and overall ratios were calculated using the same method.

STATISTICAL ANALYSIS

The mean, range, and standard deviation were calculated for the size of the teeth. The Bolton anterior ratio (the ratio between the mesiodistal widths of the 6 anterior mandibular teeth and the mesiodistal widths of the 6 anterior maxillary teeth) and the Bolton overall ratio (the ratio between the mesiodistal widths of the 12 mandibular teeth and the mesiodistal widths of the 12 maxillary teeth, from first permanent molar to first permanent molar) were calculated. A 2-sample t-test was used to test for statistical difference between means. The measurement error amounted to 0.2 mm.

TABLES

	CLASS I		**CLASS II DIVISION 1**		**Normal Occlusion vs Class II**
	Mean	SD	Mean	SD	Division 1
Intercanine : Upper	46.81	3.50	48.08	2.60	NS
Intercanine : Lower	37.45	2.63	37.44	2.53	NS
Intermolar : Upper	93.80	2.27	95.73	4.09	NS
Intermolar : Lower	87.10	2.73	87.87	2.59	NS
Anterior Ratio (ic) :L/U	80.47	2.82	77.91	4.53	NS
Overall Ratio (im) : L/U	92.93	3.89	91.76	3.93	NS

TABLE - 1. Mean and Standard Deviation (M 6 SD) of Anterior and Overall Bolton Ratios in the Different Malocclusion Groups in Percent (%) - Males Measurements are in mm. SD indicates standard deviation; NS, not significant.
* P < 0.05, ** P < 0.01, *** P < 0.001.

	CLASS I		**CLASS II DIVISION 1**		**Normal Occlusion vs Class II**
	Mean	SD	Mean	SD	Division 1
Intercanine : Upper	44.97	2.53	45.86	2.72	NS
Intercanine : Lower	34.49	1.78	36.06	2.43	*
Intermolar : Upper	90.48	4.30	92.80	2.92	**
Intermolar : Lower	82.38	3.37	84.55	2.67	**
Anterior Ratio (ic) :L/U	76.82	3.94	78.66	3.28	*
Overall Ratio (im) : L/U	91.11	3.05	91.13	2.25	NS

TABLE 2. Mean and Standard Deviation (M 6 SD) of Anterior and Overall Bolton Ratios in the Different Malocclusion Groups in Percent (%) - Females
Measurements are in mm. SD indicates standard deviation; NS, not significant.
* P < 0.05, ** P < 0.01, *** P < 0.001.

	CLASS I	CLASS II DIVISION 1
Intercanine : Upper	**	***
Intercanine : Lower	NS	*
Intermolar : Upper	*	**
Intermolar : Lower	***	**
Anterior Ratio (ic) :L/U	*	NS
Overall Ratio (im) : L/U	*	NS

TABLE 3. P-value (Males vs Females)
Measurements are in mm
NS, not significant, * P < 0.05, ** P < 0.01, *** P < 0.001.

RESULTS

No statistically significant difference was found in the anterior or overall ratios for males. Slightly statistically significant difference was found in the anterior ratio for females.

DISCUSSION

In this study , no statistically significant difference was found in the anterior or overall ratios for males. Slightly statistically significant difference was found in the anterior ratio for females.
Fattahi et al9 had analyzed tooth size ratios of Angle Class I, Class II division 1, Class II division 2, and Class III groups with the corresponding skeletal characteristics in an Iranian population and demonstrated significant sex differences in the anterior ratio among the malocclusion groups, but not the overall ratio.
Our results suggest that there is no significant difference in the distribution of anterior or overall tooth size discrepancy among the malocclusion groups and the result is consistent with those reported by Araujo and Souki10, Crosby and Alexander11, and Akyalcin et al12.

CONCLUSION

- No statistically significant difference was found in the anterior or overall ratios for males. Slightly statistically significant difference was found in the anterior ratio for females.
- Bolton's values can be used with confidence in North Indian (Punjab) population.

REFERENCES

1. Bolton WA. Disharmony in tooth size and its relation to the analysis and treatment of malocclusion. Angle Orthod. 1958;28:113–130.
2. Neff CW. Tailored occlusion with the anterior coefficient. Am J Orthod. 1949;35:309–313.
3. Bolton WA. The clinical application of a tooth-size analysis. Am J Orthod. 1962;48:504–529.
4. Moyers RE, Van Der Linden FPGM, Riolo ML, et al. Standards of Human Occlusal Development. Monograph 5. Ann Arbor, Mich: Center for Human Growth and Development, University of Michigan; 1976.
5. Lavelle CL. Maxillary and mandibular tooth size in different racial groups and in different occlusal categories. Am J Orthod. 1972;61:29–37.
6. Smith SS, Buschang PH, Watanabe E. Interarch tooth size relationships of 3 populations: ''Does Bolton's analysis apply?'' Am J Orthod Dentofacial Orthop. 2000;117:169–174.
7. Nie Q, Lin J. Comparison of intermaxillary tooth size discrepancies among different malocclusion groups. Am J Orthod Dentofacial Orthop. 1999;116:539–544.
8. Ta TA, Ling JKY, Ha¨gg U. Tooth-size discrepancies among different occlusion groups of southern Chinese children. Am J Orthod Dentofacial Orthop. 2001;120:556–558.
9. Fattahi HR, Pakshir HR, Hedayati Z. Comparison of tooth size discrepancies among different malocclusion groups. Eur J Orthod. 2006; 28: 491–495.
10. Araujo E, Souki M. Bolton anterior tooth size discrepancies among different malocclusion groups. Angle Orthod. 2003; 73:307–313.
11. Crosby DR, Alexander CG. The occurrence of tooth size discrepancies among different malocclusion groups. Am J Orthod Dentofac Orthop. 1989;95:457–461.
12. Akyalcin S, Dogan S, Dincer B, Ertan Erdinc AM, Oncag G. Bolton tooth size discrepancies in skeletal class I individuals presenting with different dental Angle classifications. Angle Orthod. 2006;76:637–643.

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