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"COMPARISON OF TOOTH SIZE DISCREPANCIES BETWEEN SKELETAL CLASS I AND CLASS II MALOCCLUSION GROUPS IN A SAMPLE OF DAVANGERE POPULATION - A STUDY MODEL ANALYSIS"

Dental Science

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ABSTRACT

OBJECTIVES To determine and compare discrepancy for anterior and overall tooth size ratios among class I and class II malocclusions in Davangere population and to compare the values with Bolton's standard values.

METHOD First group comprised of 50 patients with class I skeletal and dental malocclusion and second group of 50 class II skeletal and dental malocclusion. Evaluation and comparison of anterior and overall ratios of both the groups was done with each other to find out TSD and was compared with Bolton's standard and a standard ratio for Davangere population was developed.

RESULTS Anterior ratio for class I was 77.51% and for class II malocclusion was 76.89%. On comparison with standard Bolton's ratio a statistically significant difference was found only for the overall ratio for class I malocclusion.

CONCLUSION: It suggests excess of tooth material in lower arch in class I malocclusion of Davangere population.

KEYWORDS

Tooth size, Davangere, Bolton's ratio

Introduction

The importance of tooth size ratios in orthodontic diagnosis has been widely reported in the literature and accepted by the orthodontic community because the relationship between the upper and lower anterior dentitions is related to orthodontic finishing excellence. A coordinated proportion between the mesio-distal dimensions of the upper and lower teeth is necessary for good intercuspation. The presence of a tooth size discrepancy prevents the achievement of an ideal occlusion.[1]

A tooth-size discrepancy (TSD) conventionally has been described as a relative excess of tooth structure in one arch in relation to the other arch. It is also widely defined as a degree of disproportion among the size of individual teeth.[2]

Bolton's analysis, based on the ratios between the mesio-distal width of the mandibular and maxillary teeth, is the most popular and best known method for determining tooth size abnormality. He studied 55 Caucasian and obtained an anterior and overall ratio of 91.36±1.91 % and 77.26±1.65 % respectively.[3]

But the reliability of Bolton ratio may be an over simplification when they are used flatly in any population irrespective of ethnic variation. Tooth size variations exist among various ethnic groups therefore; different diagnostic standards should be established for each racial group.

The purpose of this study is to determine and compare the tooth size discrepancies in anterior and the overall ratios for skeletal class I and class II malocclusion groups in Davangere population.

Materials and methods

Pretreatment study models of patients were collected from the record section of the Department of Orthodontics and Dentofacial Orthopedics.

The study was carried out on 100 patients who were divided into 2 groups:

Group I: 50 patients with class I skeletal and dental malocclusion.
Group II: 50 patients with class II skeletal and dental malocclusion.

Inclusion criteria

1. Skeletal and dental class I cases with good quality study models having ANB of 0 to 4 degrees and class I molar relation bilaterally.
2. Skeletal and dental class II cases with good quality study models having ANB greater than 4 degrees and class II molar relation bilaterally.
3. All permanent teeth (except second and third molars) erupted in both upper and lower arches.

Exclusion criteria

1. Cases with presence of any craniofacial and dental deformity or severe mesio-distal and occlusal tooth abrasion.
2. Study models with teeth having restorations extending to the mesial or distal surfaces.

The Anterior and Overall ratios were calculated with the following formulas according to Bolton's specifications using a digital caliper to the nearest of 0.01mm.

$$\text{Anterior ratio: } \frac{\text{sum of mandibular "6"}}{\text{sum of maxillary "6"}} \times 100$$

$$\text{Overall ratio: } \frac{\text{sum of mandibular "12"}}{\text{sum of maxillary "12"}} \times 100$$

The two values were calculated separately for both the groups (class I and class II malocclusions) and compared with each other and with Bolton's standards. Hence, a standard value for both anterior and overall ratios was determined. The values obtained were statistically analyzed using the student unpaired -t- test.

Results

Anterior ratio (Table 1)

Anterior ratio for class I was found to be 77.51% and for class II to be 76.89% with insignificant intergroup difference.

Comparison of anterior ratio with Bolton's standard (Table 2, 3)
Insignificant difference was found for both the groups.

Overall ratio (Table 4)
The overall ratio for class I malocclusion was 91.95 and for class II malocclusion was 91.03. Intergroup comparison showed insignificant difference.

Comparison of overall ratio with Bolton's standard (Table 5, 6)
Only Class I group showed a significant difference.

Standard Anterior and overall ratio (Table 7)
The Standard anterior and overall ratio derived for Davangere population was 77.20% and 91.49% respectively.

Table 1: Intergroup comparison of anterior ratios

	Anterior ratio (%)					
Groups	Mean	Std. Deviation	Std. Error Mean	t-testa value	P-value	Mean Difference
class I group	77.51	2.62	0.37	1.029	0.306	0.623
class II group	76.89	3.38	0.48			

Table 2: Comparison of anterior ratios of Group I and Bolton's Standard ratio.

	Anterior ratio (%)					
Groups	Mean	Std. Deviation	Std. Error Mean	t-testa value	P-value	Mean Difference
Class I group	77.51	2.62	0.37	0.708	0.480	0.310
Bolton's Ratio	77.20	1.65	0.22			

Table 3: Comparison of anterior ratios of Group II and Bolton's Standard ratio.

	Anterior ratio (%)					
Groups	Mean	Std. Deviation	Std. Error Mean	t-testa value	P-value	Mean Difference
Class II group	76.89	3.38	0.48	0.5828	0.561	-0.310
Bolton's Ratio	77.20	1.65	0.22			

Table 4: Intergroup comparison of overall ratios

	Overall ratio (%)					
Groups	Mean	Std. Deviation	Std. Error Mean	t-test[a] value	P-value	Mean Difference
Class I group	91.95	2.27	0.32	1.939	0.055	0.919
Class II group	91.03	2.46	0.35			

Table 5: Comparison of overall ratios of Group I and Bolton's Standard ratio.

	Overall ratio (%)					
Groups	Mean	Std. Deviation	Std. Error Mean	t-test[a] value	P-value	Mean Difference
Class I group	91.95	2.27	0.32	2.070	0.040*	0.65
Bolton's Ratio	91.30	1.91	0.26			

Table 6: Comparison of overall ratios of Group II and Bolton's Standard ratio.

	Overall ratio (%)					
Groups	Mean	Std. Deviation	Std. Error Mean	t-test[a] value	P-value	Mean Difference
Class II group	91.03	2.46	0.35	0.841	0.401	-0.27
Bolton's Ratio	91.30	1.91	0.26			

Table 7: Standard anterior and overall ratios for Davangere population

	Mean	Std. Deviation
Anterior ratio (%)	77.20	3.03
Overall ratio (%)	91.49	2.40

Discussion

The aim of the study was to determine and compare discrepancy for anterior and overall ratios among class I and class II malocclusions and also compare the values obtained with Bolton's standard values.

The class I subjects were found to have a mean Anterior ratio of 77.51% which is little higher than the Bolton's standards. It signifies larger mesio distal dimension of mandibular anterior teeth for class I subjects. Similar results have been found by Tancan Uysal et al. and Toshiya Endo et al.[4,5] The class II subjects had a mean anterior ratio of 76.89 % which is lower than the Bolton's standards. It signifies smaller mesio distal dimension of mandibular anterior teeth for class II subjects.

The class I subjects were found to have a mean overall ratio of 91.95 % which was higher than the Bolton's standards. Similar results have been found by Tancan Uysal et al.[4] The class II subjects had a mean overall ratio of 91.03% which was lower than the Bolton's standards as found by other studies.[4-6]

The anterior and overall ratios of class I and class II malocclusions were compared with each other and no significant difference was found in line with other studies done among Indian and Chinese.[7,8] While few studies have found out no significant TSD between class I and class II malocclusion groups.[9,10] The results were in disagreement with few studies which reported statistically significant differences in tooth size ratios among different malocclusion groups.[1,11] The comparison of overall value between class I and class II showed though insignificant, but some amount of discrepancy to be present between the two groups.

The anterior and the overall ratios of both the malocclusions were compared with the Bolton's standards. However, significant difference was obtained only for the overall ratio of class I malocclusion showing excess of tooth material in lower arch. This may be due to increased mesio distal width of mandibular premolars in class I malocclusions of Davangere population.

Comparison of standard ratios of our sample with Bolton's standard ratio showed statistically insignificant result and so Bolton's standard ratios can be applied to our population also. Many studies done on Indian population have also found similar result.[7,12-14]

In clinical practice any correction for TSD may be based on ratio in percentage terms, but is carried out in absolute millimeters of change in tooth widths. TSD of 1 SD accounting for less than 1.5mm is clinically insignificant. However, values outside 2 SD are considered significant which in millimeters accounts to a value of more than 2 mm.[2] In the present study, the percentages of subjects with clinically significant TSD for the anterior and overall ratio were 27% and 16% per cent, respectively, agreeing with the studiesdone in the past.[11,15-17]

Bolton and Proffit reported less than 5 per cent of cases with an overall Bolton discrepancy exceeding 2 SD.[2,3] However, their studies included populations with excellent occlusion, which may be considered representative of the general population, but not of patients needing orthodontic treatment.

In the present study values of TSD outside 1 SD were 56% and 39% for anterior and overall ratios respectively.

The anterior ratio as found out in other similar studies are 79.6% in Whites, 79.3% in Blacks, 80.5% in Hispanics, 78.1% in Dominican Americans, 78.15% in Turkish , 78.32% in Spanish , 78.09% in Peruvians, 78.99% in Syrian, 78.0% in Iranian and 78.04% in Nepalese.[7,15,17-21]

Similarly the overall ratios were observed as 92.30% in Whites, 93.40% in Blacks, 93.1% in Hispanics, 91.3% in Dominican Americans, 91.97% in Spanish, 92.26% in Syrians and 92.0% in Iranian.[15,17,19,20,22]

Hence an orthodontist should be aware of these discrepancies and Bolton's analysis should routinely be performed on all patients, regardless of ethnicity, sex, or malocclusion category.

Conclusion

1. A significant difference was found between overall ratios of Davangere population compared to Bolton's sample indicating increased mesio distal width of mandibular premolars in its class I malocclusions.
2. Out of 100 subjects, the values of TSD outside 1 SD were 56% and 39% for anterior and overall ratios respectively and subjects with clinically significant TSD outside 2 SD for the anterior and overall

ratio were 27% and 16% per cent, respectively.

3. For Davangere population, anterior ratio derived was 77.20% with a SD of 3.03 whereas overall ratio was 91.49% with a SD of 2.40. The ratios reported here were close to those given by Bolton for his sample. This implies that Bolton's standard ratio can be applied to this population also.

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