RESEARCH ARTICLE

COMPARATIVE EVALUATION OF BOLTAN'S DISCREPANCIES BETWEEN MALE AND FEMALE IN NORTHERN INDIA

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ABSTRACT

Present research involves the evaluation of Bolton discrepancies among the male and female visit the Government Dental College and Hospital, Patiala. **Methods:** Total 330 samples were taken which involve 160 of male and 170 of female patients. Statistical analysis was done in respect of Bolton's anterior ratio and overall ratio was calculated. **Results:** North Indians, the mean overall interact tooth width ratio among males was slightly higher than the females. Mean overall anterior interact tooth width ratio among males was also observed found to be vaguely higher as compared with females. **Conclusion:** Bolton's ratios could be consistent to use in the orthodontic diagnosis of North Indian population. It supports the concept that females showed bit smaller ratio than the males.

INTRODUCTION

Facial aesthetics is dependent thoroughly on architectural liaison of facial skeleton so as to give out the base for structural balance. The virtual relationship of tooth material of the upper arch to the lower arch is the prerequisite to accomplish practical occlusion and healthy protection of the system. The occurrence of inter-arch tooth size incongruity leads to mal-relationship between the arches with decreased functional competence and disfigurement in aesthetic harmony. Variations are found in tooth size of among the individuals and in populations. Accumulated evidence indicates that there is complex interaction found between genetic and environmental factors [1]. A balanced relationship found between mesio-distal widths of maxillary dentition to that of the mandibular dentition leads an optimal post-treatment occlusion [2].

Tooth size discrepancy, the Bolton analysis, is the ratios between the mesio-distal tooth diameter sums of the mandibular and the maxillary dentitions, remains the most recognized method for detecting inter-arch tooth size discrepancies [3]. Study also reported that overall and anterior ratios based on 55 patients with excellent Class I occlusions, in addition, introduced mathematical tooth size ratios [4]. Although Bolton's analysis has demonstrated extremely helpful in the clinical setting to guide the orthodontist in cases with tremendous tooth size discrepancies, it is not without limitations. First, Bolton's estimates of variation were underestimated because his sample was derived from perfect Class I occlusions. Secondly, and perhaps more importantly, the population and gender composition of Bolton's sample were not specified, which implies potential selection bias [5]. A high occurrence of tooth size discrepancies in an orthodontic patient population and the statistically significant correlation of these dental characteristics recommend that the extent of inter-arch tooth size ratios might be clinically beneficial for treatment outcomes [6].

Literature suggested the smaller tooth size ratios in women than in men, but the differences at 0.6–1.0% that were not significant. It is reported by the researchers that the black people had the highest overall tooth size ratios (93.4%), followed by Hispanics (92.3%) and whites (91.2%)[5]. There are several methods available to evaluate the mesiodistal width of teeth such as conventional fine–pointed caliper or digital caliper, measuring photocopies of casts with a caliper, divider, etc[7,8,9]. The purpose of this study was to evaluate the Bolton ratio in a North Indian population between male and female group.

MATERIALS AND METHOD

Samples were screened among the patients attending Department of Orthodontics, Patiala (India). The samples were selected on the basis of inclusion criteria of the healthy subjects of north Indian origin and age ranging from 12-18

years. All subjects were without any previous history of orthodontic treatment. All subjects were without clinically visible dental caries, periodontal disease, proximal restorations, attrition, stripping of proximal areas and without any craniofacial and dental anomalies.

Dental stone study models were made using alginate impression material. Tooth size was measured directly on study model using Boley gauge with a digital vernier scale (Workzone) of 0.05 mm accuracy. Tooth size or mesio-distal tooth width was obtained by measuring the maximum distance between mesial and distal contact points with the caliper tips placed perpendicular to the long axis of each tooth. The sharp tips of the calipers facilitated accuracy. A precision reading to the nearest 0.1mm was used to measure the tooth size. A single investigator measured each arch twice to avoid inter-operator variability.

If the second measurement differed by more than 0.2 mm from the first measurement, the tooth was measured again. The measurements included the mesio-distal widths of all maxillary and mandibular teeth from the right first permanent molar to left first permanent molar. Bolton's anterior ratio i.e. ratio between the mesio-distal widths of 6 anterior mandibular teeth and mesio-distal widths of 6 anterior maxillary teeth and Bolton's overall ratio i.e. the ratio between mesio-distal widths of 12 mandibular teeth and mesio-distal widths of 12 maxillary teeth from right first permanent molar to left first permanent molar were calculated. Descriptive statistics including mean, standard deviation, range in respect of Bolton's anterior ratio and overall ratio were calculated using Microsoft Excel 2007 and Minitab version15.0 programs. The coefficient of variation was calculated to determine the tooth size ratios.

RESULTS AND OBSERVATION

Results suggested that in North Indians, the mean overall interarch tooth width ratio among males was slightly higher than the females. Mean overall anterior interarch tooth width ratio among males was also observed found to be vaguely higher as compared with females. (Table 1)

The mean [SD] and statistical comparisons of the MD tooth width for males and females are shown in table 1. It was also observed that, males showed significantly wider MD tooth width compared to females. Table 2, shows that no significant sex differences [**P** >0.05] was observed between the anterior Tooth size discrepancies ratio in males [78.0±2.4%] and females [78.2± 2.8%].

DISCUSSION

Some researcher observed that 55 Caucasian subjects having normal occlusion where his mean anterior ratio value was 77.2. Detailed and refined tooth positioning is required in the finishing stage of orthodontic treatment which is complicated to be reached in the existence of a tooth size discrepancy (TSD)[10]. North Indian subjects including males and females were included in this research study.

Tooth size and inter-arch discrepancies were determine in the present study in among the north Indian subjects. The study cast is the only non-invasive three dimensional records that provide information in orthodontic diagnosis and treatment planning. Dental casts are still considered a vital diagnostic tool in orthodontic practice and facilitate the analysis of tooth size and shape; alignment and rotations of the teeth, arch width, length, form and symmetry and the occlusal relationship [11].

Bolton values most commonly calculated to assess the frequency of changes as well as to evaluate their clinical importance. More than 1.5 mm tooth size discrepancy, considered as clinically significant. Various studies have been carried out to check for the gender differences in the Bolton ratios. Our study suggested no significant differences in Bolton ratios according to gender and this was in accordance with previous studies [12, 13, 14]

Approximately 5% of the population has some degree of disproportion among the size of individual teeth[15].

Table 1 Mean (SD) for maxillary and mandibular mesiodistal tooth widths (mm) in study subjects

Arch		Range	Gender		*p*-value
			Male (SD) N= 160	Female (SD) N= 170	
Maxillary	Central incisor	6.50- 10.40	8.80 (0.57)	8.50 (0.55)	<0.001
	Lateral Incisor	5.02- 8.20	6.90 (0.47)	6.70 (0.57)	0.009
	Cannine	6.58- 9.23	8.00 (0.41)	7.50 (0.43)	<0.001
	First Premolar	5.92- 8.10	7.04 (0.44)	7.00 (0.41)	0.113
	Second Premolar	5.62- 7.82	6.72 (0.41)	6.67 (0.40)	0.037
	First Molar	9.04-12.20	10.50 (0.56)	10.30 (0.57)	0.001
Mean cumulative teeth width			47.96	46.67	
Mean difference			**1.29**		
Mandibular	Central incisor	4.42- 6.47	5.42 (0.36)	5.38 (0.35)	0.210
	Lateral Incisor	4.94-7.13	6.00 (0.37)	5.92 (0.37)	0.028
	Cannine	5.17-8.57	7.07 (0.42)	6.69 (0.40)	<0.001
	First Premolar	5.90-8.34	7.11 (0.40)	6.99 (0.42)	0.017
	Second Premolar	5.96-9.06	7.28 (0.44)	7.10 (0.44)	0.001
	First Molar	9.24-13.68	11.30 (0.65)	11.01 (0.62)	<0.001
Mean cumulative teeth width			44.18	43.09	
Mean difference			**1.09**		

Table 2 Comparison of Bolton's Ratio

	Mean (SD)	Range	Male, Mean (SD)	Female, Mean (SD)	*p*-value
Anterior ratio	78.1 (2.4)	71-87.1	78.0 (2.4)	78.2 (2.8)	0.37
Overall ratio	91.1 (2.1)	83.2- 97.3	91.2 (2.2)	91.0 (2.1)	0.50
Anterior ratio (Bolton)	77.1 (1.6)	74.4-80.3			
Overall ratio (Bolton)	91.2 (1.9)	87.3-95.6			

Therefore, it is logical to calculate the mesio-distal width of maxillary and mandibular teeth in normal as well as in moderate crowding cases of North Indian population. From these data Bolton ratios were calculated and compared with original values. The present study found that the Bolton's ratio values are slightly changed that of the original data of population. However the anterior and overall ratio developed by Bolton can be used on North Indian population.

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