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INTERMAXILLARY EVALUATION OF THE MESIODISTAL TOOTH CONFIGURATION IN PATIENTS WITH UNILATERAL PEG SHAPE MAXILLARY LATERAL INCISOR

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ABSTRACT

Mesiodistal crown diameters were measured from twenty pairs of orthodontic pretreatment orthodontic study casts with unilateral peg-shaped maxillary lateral incisors (group I). The control reference sample consisted of twenty pairs of orthodontic study casts with accepted occlusion (group II) matched with the peg-shaped sample according to age and sex. The age range was 14-26 years, both sex were included 11 female and 9 male. The statistical analysis showed an obvious reduction in mesiodistal size of intermaxillary tooth measurements in both sexes in group I. In comparing between the intermaxillary tooth size measurements in females showing peg shape maxillary lateral incisor and control female group, a highly significant reduction in lateral incisors and significant reduction in central incisors, canine and 1st premolar in the upper arch was recorded. Also, a significant reduction in canine and 2nd premolar was observed in the lower arch. However, in comparing between the intermaxillary tooth size measurements in males showing peg shape maxillary lateral incisor and control male group, in the upper arch, a highly significant reduction in lateral incisors and first and second premolars and significant reduction in central incisors, canine was observed. Furthermore, a highly significant reduction was recorded in central and lateral incisors and also first and second premolars, while the canine reported a significant reduction in the lower arch.

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Significant reduction was found in most of the measurements in female than male in gender comparisons for group 1 subgroups, especially upper premolars The importance of tooth size reduction in orthodontic diagnosis was determined because the relationship between the upper and lower anterior and posterior dentitions is related to orthodontic finishing excellence. The results of the current investigation are of great value in confirming the presence of intermaxillary mesiodistal tooth size reduction in patients showing unilateral peg-shaped maxillary lateral incisors. Also this will allow orthodontists to gain insight into the functional and esthetic outcome of a given case.

INTRODUCTION

A peg-shaped maxillary lateral incisor was defined as a severe, conical crown – size reduction of this tooth, reducing in diameter from the cervix to the incisal edge[1] Variation in tooth size is influenced by genetic and environmental factors.[2] Some of the factors which contribute to the variability of permanent tooth size are: race,[3,4] sex,[3] hereditary,[5] environment,[6] and secular changes,[7] and bilateral asymmetry.[8,9] Environmental variables such as nutrition, disease or climate affect the dentition during the prenatal period, but seem to have little influence on normal dental variation.[2]

The unilateral peg shape lateral incisors presented an esthetic problem in addition to preexisting malocclusion. The prevalence of peg-shaped anomaly and strongly mesiodistaly-reduced laterals was determined in a sample of Egyptian population and the results were equal to 44%. However, the number of females showed the problem was 3.8 times that of males, also the laterality of this anomaly tended to be on the right side more than left side.[10] Clinicians agree that tooth agenesis regardless of gender or race becomes more prominent in recent societies. It is not known whether this observation is an aberration related to better detection methods and patient's awareness or whether it is a real trend toward increased prevalence of dental abnormalities.[11]

The concept of ideal intercuspation assumes a strict relationship between tooth size and the size of maxillary and mandibular arches.[12] Specific dimensional relationships must exist between the maxillary and mandibular teeth to ensure proper interdigitation, overbite, and overjet. Because patients with interarch tooth size discrepancies require either removal or addition of tooth

structure to open or close spaces in the opposite arch, it is important to determine the amount and location of a tooth size discrepancy before starting treatment.[13] Black[14] was one of the first investigators to measure tooth sizes, and his tables of mean tooth sizes are still used today. The tooth size measurements of Wheeler[15] also are frequently used.

Hashim and Al-Ghamdi [16] established tooth width and arch dimensions in normal and malocclusion samples and compared tooth width and arch dimensions between males and females in normal and malocclusion samples. They found that, significant differences in tooth width between normal and malocclusion samples. Also, there was statistical significant difference in tooth width between males and females where the males showed higher mean values.

Uysal et al [17] aimed to identify the possible sex differences in tooth size ratios between sexes, and to determine whether there is a difference in the incidence of tooth size discrepancies for both the anterior and overall ratios when comparing with Angle malocclusion groups, when compared with untreated normal occlusion subjects. They concluded a significant sex difference only in the overall ratio for normal occlusion subjects, and all malocclusion groups showed statistically significant higher overall ratios than the normal occlusion group.

To achieve an ideal and satisfactory relationship between the maxillary and mandibular arches, it is important to examine the mesiodistal width of the teeth. Therefore, in the present study, the intermaxillary mesiodistal tooth size measurements were determined from orthodontic pretreatment study cast for cases showing unilateral peg shape maxillary lateral incisor, regardless the present malocclusion and compared to a control group using measurements taken from casts represented normal occlusion. This study was performed in a sample of Egyptian population.

Materials and method

Sample:

It comprised of twenty pairs of orthodontic pretreatment study casts with unilateral peg-shaped maxillary lateral incisors (group I). The control reference sample consisted of twenty pairs of orthodontic study casts with accepted occlusion (group II) matched with the peg-shaped sample according to age and sex. The age of the collected sample ranges from 14 - 26 years. These casts were further subdivided according to sex, 11 female and 9 male into subgroup A and subgroup B respectively, also, the control group II was subdivided into subgroup A' and subgroup B' respectively. The cases were selected from the clinical practice of the Orthodontic Department and from the dental college, Faculty of

Oral and Dental Medicine Cairo University. The following inclusion selection criteria were included:

1- Good quality of orthodontic models of patients.

2- All permanent teeth had erupted and were present from right first molar through left first molar.

3- No severe mesiodistal and occlusal tooth abrasion.

4- No residual crown or crown-bridge restoration.

5- No record of restoration or stripping of incisor and canine teeth.

Mesiodistal tooth size measurements: All the teeth were measured at the largest mesiodistal dimension, using a caliper. The reading was recorded at the 0.1 mm level, measurements were made directly on the study casts. The same examiner made all the measurements under natural and neon light. The measurements were made as carefully as possible to avoid any damage to the casts.

A Vernier caliper was used to measure the mesiodistal crown diameters of all teeth according to the method described by Moorrees et al [18] and Hunter and Priest.[4] The width of each tooth was measured from its mesial contact point to its distal contact at its greatest inter proximal distance. The caliper held occlusal and parallel to the long axis of the tooth. The beaks were then closed until gentle contact was made with the contact points of the teeth. The measurements included the mesiodistal width of all the twelve maxillary and mandibular teeth from the right first permanent molar to the left first permanent molar on 20 pairs of casts (the peg shape lateral incisor group). However, the measurements of the 20 pairs representing the normal occlusion group were obtained from a previous study[19] and the mean of the measurements were taken.

All statistical analysis were performed using the SPSS software package, mean(x), standard deviation (SD) values were calculated for each measurements and separately for males and females. To determine whether there are tooth size discrepancies between group I and II and between male and female a student's t-test was performed.

RESULTS

In a comparison between the measurements of group I and group II, a reduction in mesiodistal size of teeth was observed in all the measured teeth in either arches and in both sexes in the group I.

Intermaxillary tooth size measurements in females showing peg shape maxillary lateral incisor (group I subgroup A) in comparison to normal control casts (group II subgroup A') recorded a highly significant reduction in lateral incisors at $p<0.01$ and significant reduction at $p<0.05$ in central incisors, canine and first premolar in the upper arch. In the lower arch a significant reduction at $p<0.05$ in canine and second premolar was observed (Table I and figures 2&3).

Table I: Intermaxillary tooth size measurements in females showing peg shape lateral maxillary incisor in comparison to normal control casts:

Variables	Upper arch					Lower arch				
	subgroup A		subgroup A'		t-test	subgroup A		subgroup A'		t-test
	x	SD	x	SD		x	SD	x	SD	
Central Incisor	8.81	± 0.46	9.2 ±	0.48	-1.85*	5.64	±0.35	5.64	±0.23	1.00NS
Lateral Incisor	5.68	±0.63	7.27±	0.66	-5.51**	6.14	±0.49	6.33	±0.39	-1.06NS
Canine	7.64	±0.39	8.03±	0.18	-2.83*	6.71	±0.54	7.09	±0.28	-1.97*
First premolar	7.24	±0.47	7.72±	0.35	-2.57*	7.23	±0.55	7.54	±0.38	-1.47NS
Second Premolar	6.89	±0.48	7.18±	0.31	-1.60NS	7.32	±0.43	7.71	±0.28	-2.41*
First molar	10.65	±0.70	10.97±	0.51	-1.17NS	11.26	±0.79	11.61	±0.37	-1.26NS

NS: $p > 0.05$ *$p < 0.05$ **$p < 0.01$

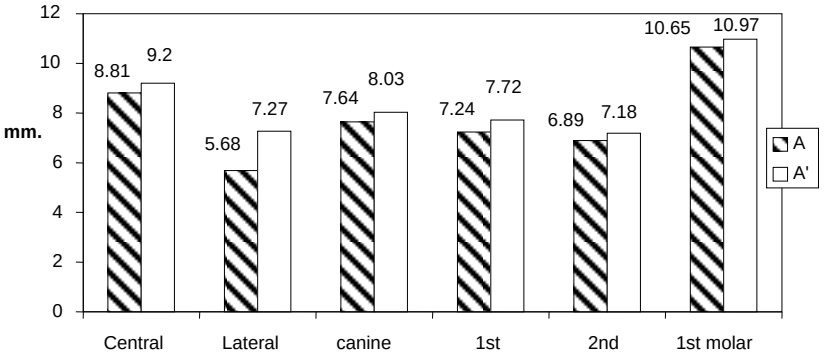

Fig.2: Mesiodistal width for upper teeth in subgroup A vs. subgroup A'.

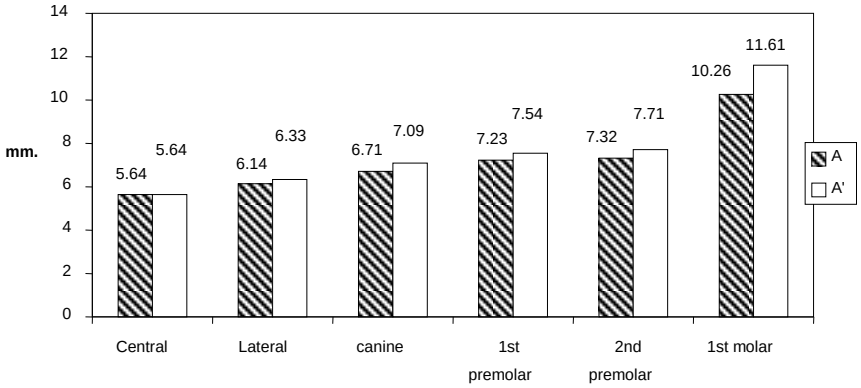

Fig.3: Mesiodistal width for lower teeth in subgroup A vs. subgroup A'.

However, the intermaxillary tooth size measurements in males showing peg shape maxillary lateral incisor (group I subgroup B) in comparison to normal control casts (group II subgroup B') recorded a highly significant reduction in lateral incisors and first and second premolars at $p<0.01$ and significant reduction at $p<0.05$ in central incisors, canine in the upper arch. A highly significant reduction at $p<0.01$ was recorded in central and lateral incisors and also first and second premolars, while the canine reported a significant reduction at $p<0.05$ in the lower arch, as represented in table II and figures 4& 5.

Table II: Intermaxillary tooth size measurements in males showing peg shape lateral maxillary incisor in comparison to normal control casts:

Variables	Upper arch					Lower arch				
	subgroup B		subgroup B'		t-test	subgroup B		subgroup B'		t-test
	x	SD	x	SD		x	SD	x	SD	
Central Incisor	8.69	±0.86	9.28	±0.47	-1.91*	5.40	±0.14	5.95	±0.25	-6.05**
Lateral Incisor	5.61	±0.73	7.47	±0.51	-6.62**	5.84	±0.34	6.62	±0.36	-4.99**
Canine	7.72	±0.44	8.17	±0.54	-2.03*	6.82	±0.59	7.45	±0.41	-2.76*
First premolar	6.68	±0.23	7.51	±0.39	-5.81**	7.04	±0.13	7.60	±0.51	-3.37**
Second Premolar	6.44	±0.05	7.23	±0.31	-7.88**	7.05	±0.26	7.65	±0.56	-3.06**
First molar	10.65	±0.51	10.86	±0.56	0.88NS	11.66	±0.57	11.71	±0.49	-0.21NS

NS: $p>0.05$ *$p<0.05$ **$p<0.01$

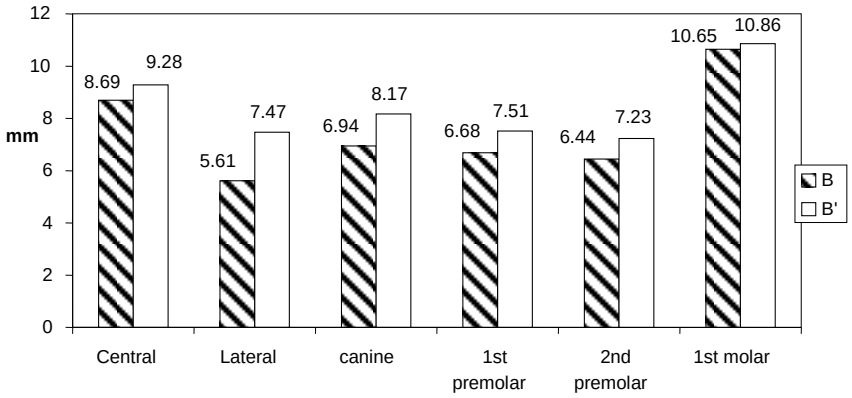

Fig.4: Mesiodistal width for upper teeth in subgroup B vs. subgroup B'.

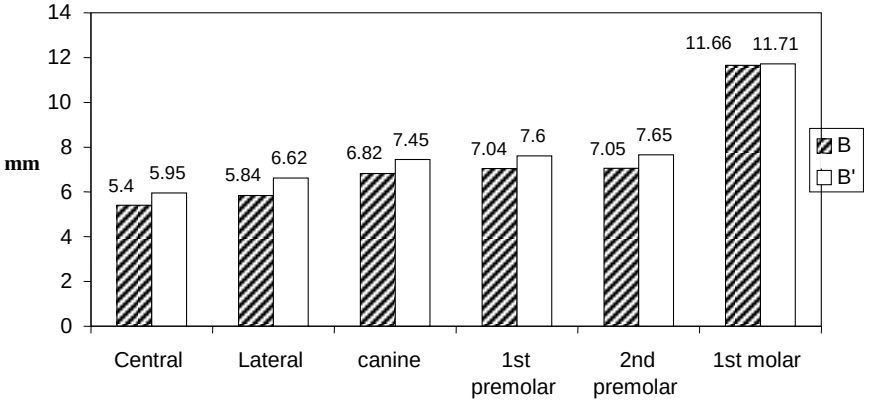

Fig.5: Mesiodistal width for lower teeth in subgroup B vs. subgroup B'.

Gender comparisons for group I having peg shape maxillary lateral incisor subgroups, recorded a reduction in most of the measurements in female than male. In the upper arch, a highly significant reduction in first and second premolars at $p<0.01$ was obvious. While in the lower arch, the central incisor recorded a significant reduction at $p<0.05$, as shown in table III.

Table III: Intermaxillary tooth size measurements and gender comparisons for group I showing peg shape maxillary lateral incisor:

Variables	Upper arch					Lower arch				
	subgroup B		subgroup A		t-test	subgroup B		subgroup A		t-test
	x	SD	x	SD		x	SD	x	SD	
Central Incisor	8.69	±0.86	8.81	±0.46	-0.39NS	5.40	±0.14	5.64	±0.35	-2.00*
Lateral Incisor	5.61	±0.73	5.68	±0.63	-0.23NS	5.84	±0.34	6.14	±0.49	-1.59 NS
Canine	7.72	±0.44	7.64	±0.39	0.43NS	6.82	±0.59	6.71	±0.54	0.43 NS
First premolar	6.68	±0.23	7.24	±0.47	-3.4**	7.04	±0.13	7.23	±0.55	-1.06 NS
Second Premolar	6.44	±0.05	6.89	±0.48	-2.94**	7.05	±0.26	7.32	±0.43	-1.69 NS
First molar	10.65	±0.51	10.65	±0.70	1.00NS	11.66	±0.57	11.26	±0.79	1.29 NS

NS: p>0.05 *p<0.05 **p<0.01

DISCUSSION

Dentists in general and orthodontists in particular are cognizant of variation in the size of teeth and how these difference can influence a number of clinical restorative and orthodontic procedures.

Harmony in the mesiodistal widths of the maxillary and mandibular teeth is a major factor in coordinating posterior interdigitation, overbite, and overjet in centric occlusion.[20] Although the natural teeth match well in most individuals, approximately 5% of the populations have some degree of discrepancy among the sizes of individual teeth. A significant variation in this harmony will lead to malocclusion and difficulties in obtaining an occlusion with optimal overjet, overbite, and class I canine and molar relationship.[21]

In fact, identification of genetic mutations in families with tooth agenesis or other dental anomalies will enable preclinical diagnosis and permit improved orthodontic treatment.[11] An anomaly in the size of the maxillary lateral incisors is the most common cause of tooth size discrepancy. In the present study, intermaxillary mesiodistal tooth size variations in relation to unilateral peg shape maxillary lateral incisors was measured and compared to a normal occlusion control group in a sample of Egyptian population.

Orthodontic study models were used in this study, the question of the accuracy of plaster casts made from alginate impressions as a representation of

the actual mesiodistal tooth width was investigated by many authors.[22-25] The outcome of these studies indicated alginate impressions produce the most accurate dental casts when poured immediately. Furthermore, Hunter and Priest [4] indicated there was considerable advantage in the measurement of teeth on the dental cast rather than measuring teeth directly in the mouth.

Ballard [8] reported that the right and left mesiodistal width were different in 90% of the cases studied. This means that measuring only one side can cause a significant error; thus in this study we use the mean of both right and left measurements.

The age range of the selected sample in the present study was between 14 to 26 years "early adulthood." Doris et al [26] indicated early permanent dentitions provide the best sample for tooth size measurements because early adulthood dentitions has less mutilation and less attrition in most individuals. Consequently, the effect of these factors on the actual mesiodistal tooth width will be minimum. This was in accordance with others study. [27]

All the sample showed unilateral peg shape maxillary lateral incisor in which the contralateral one was present to determine the difference in the mesiodistal width of it and compared it to control group with normal lateral incisors.

Sex differences in mesiodistal tooth width have been documented by several investigators; therefore both sexes were included in our study, in group I and group II. Our findings confirmed that the males had represented larger teeth than females, and this was on line with others results.[16,27,28] This was also in agreement with the results of Bishara et al.[29], Hashim and Murshid[30], and Hattab et al.[31] The number of female included was higher than that of the male this was related to high prevalence of this anomaly in this sex as confirmed by others.[10]

The results of the present study showed an obvious reduction in mesiodistal size of intermaxillary tooth measurements in both sexes in group I. In comparing between the intermaxillary tooth size measurements in females showing peg shape maxillary lateral incisor and control female group, a highly significant reduction in lateral incisors and significant reduction in central incisors, canine and first premolar in the upper arch was recorded. Also, a significant reduction in canine and second premolar was observed in the lower arch.

However, in comparing between the intermaxillary tooth size measurements in males showing peg shape maxillary lateral incisor and control male group, in the upper arch, a highly significant reduction in lateral incisors and first and second premolars and significant reduction in central incisors, canine was observed.

Furthermore, a highly significant reduction was recorded in central and lateral incisors and also first and second premolars, while the canine reported a significant reduction in the lower arch.

Significant reduction was found in most of the measurements in female than male in gender comparisons for group I subgroups. In the upper arch, a highly significant reduction in first and second premolars was clear. While in the lower arch, the central incisor recorded a significant reduction.

The importance of tooth size reduction in orthodontic diagnosis was determined because the relationship between the upper and lower anterior and posterior dentitions is related to orthodontic finishing excellence. The results of the current investigation are of great value in confirming the presence of intermaxillary mesiodistal tooth size reduction in patients showing unilateral peg-shaped maxillary lateral incisors and this reduction can be a useful tool in the diagnosis, treatment and retention protocol of crowded malocclusion.

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