Identification of Sex Groups in Forensic Medicine According to the Mesiodistal Crown Diameter of Teeth

Ibrahim H. Al-Fahdawi[1]

Abstract

Background: The identification of sex groups In forensic medicine according to different criteria is of great importance.

Objectives: To identify sex groups is the mesiodistal crown diameter of the teeth.

Materials and Methods: Two samples (one sample for each sex group) of secondary school students from Ramadi city, Al-Anbar Governorate, Iraq, were considered in this study. Each sample involved 40 students. The age is ranged between 13-19 years old.

Results: Statistical t-test was performed to detect any significant difference when comparing means of crown diameter according to sex of the students as well as the side of the tooth for each sex. The result of this test revealed that half the teeth on the maxilla and more than half the teeth on the mandible are significantly different with respect to sex. Moreover, only molar and first premolar teeth on the maxilla are significantly different with respect to the side of the tooth.

Key words. Tooth size, Mesiodistal crown diameter, Iraq.

[1] Senior Lecturer, Department of Prosthetic Dentistry, College of Dentistry, Al-Anbar University, Ramadi-Iraq

http://doi.org/10.33091/AMJ.1200912011

Introduction

Mesiodistal crown diameter, also called tooth size, tooth crown size, crown length, or crown width, provides a many information relevant to human evolution and a variety of biological problems in addition to forensic and clinical odontology.The wide variation in the range of characteristics that constitute the normal occlusion is worth studying. The heterogeneous waxing of various groups, makes it mandatory to find out the normal of various attributes within the dento-facial complex[1,2,3].

The crown size of the teeth especially the mesiodistal width (or diameter) is one of the significant attributes of the normal occlusion. It is also important for the anthropologist to study the dental characteristics of the population so as to trace the ongoing process of evolutionary trend. Evolutionary anthropologists use mesiodistal width to trace the reduction of tooth size that appears to be concomitant of selective forces, technological and dietary changes during human evolution[1,2]. Tooth size furnishes human biologists with an insight into the genetic relation between populations and environmental adaptation(4,5). In forensic odontology, tooth size proves to be a reliable sex discriminator[6,7]. Of clinical interest is the interrelation between tooth size and arch alignment in which large teeth are associated with dental crowding[7,8] and third molar impaction[3,9] Moreover, an increase in tooth size may be a step toward hyperdontia whilst reduction in tooth size and right-left asymmetries of tooth widths were found in association with oligodontia of permanent dentition[10,11].

The explanations proposed for tooth size dimorphism between female and male include: variation in odontogenetictiming and enamel thickness, male have larger bodies than female, effect of sex chromosomes in promoting tooth growing, and hormone influence[12].

Black, 1902 was the first to establish the mesiodistal diameter of the teeth in North American white population, later Nelson, 1938; Ballard, 1944 and Wheelar, 1961 conducted studies to find out the mesiodistal crown width in a particular population[13,14].

Moorrees, 1957 found differences in the teeth of Alas an Aleuts and North American Caucasians measured, as well as, variation in size in female and male[15].

Identification of the sex of an unknown human body may be a very difficult task for those working in police investigation or in forensic medicine[3,9].

Mesiodistal crown diameter has been suggested as a criterion to distinguish between males and females according to a certain role [5,10].

Materials and Methods

The dental casts of the sample were considered, and the crown diameter was measured by Vernia. Normal occlusion was identified according to the following criteria:

1. Normal over bite and over jet with normal anteroposterior molars and cusped relationship with no crowding.
2. Normal straight profile with competent tips.
3. No history of previous orthodontic treatment.
4. All of the permanent teeth are present with exception of 3rd molars.

Two random samples (males and females) of secondary school students in Ramadi city, Anbar governorate, Iraq were considered. Each sample involved 40 students aged 13-19 years old, with normal occlusion and healthy facial appearance. Samples are restricted to only those students who were born and continuously lived in Ramadi city and their parents are permanent citizens of the city.

Dental cast was taken for every individual. With alginate impression in suitable perforated trays for the upper and lower dental arches. Impressions were casted in dental stone immediately to ovoid problems with distortion of the models. Mesiodistal crown width of the maxillary and mandiblar permanent teeth was then measured by vernia, and measurements were recorded on a data this is good form for such a purpose. The mesiodistal diameter of a tooth was obtained by measuring the greatest distance between approximate surfaces of the crown using a manual caliper inserted from the bucal or labial aspect and held parallel to the occlusal surface of the crown.

Statistical test (t-test) was performed to determine significant differences between means of crown diameter on the left and right side of the arch of both maxilla and mandible as well as between males and females. The p-value of less than 0.05 is considered to be statistically significant.

Results:

Table 1, showed the means, standard deviations and the ranges of the crown diameter according to the arch (maxilla and mandible), sex (male and female) and tooth position on the arch. Table 1, also showed the values of t-test and their corresponding p-values.

The standard deviations and the ranges of each tooth position suggest the existence of variability in the measurements of the diameter. Such variability can be interpreted in terms of many factors such as age of the students, sex, body size, nutrition, and many other factors (Table 1).

With respect to the right side of the maxilla, t-test revealed significant differences between means of crown diameter of molar, 2nd premolar, 1st premolar and canine according to sex groups, whereas canine and central incisor were the only teeth on the left side of maxilla that revealed significant difference when compared according to sex (Table 1).

On the other hand, t-test revealed that means of crown diameter of the molar, 1st premolar, canine and central incisor situated on the right side of the mandible are significantly different with respect to sex groups. Considering the left side of the mandible, the t-test for the comparison of the means of crown diameter revealed that molar, 1st premolar, canine and left central incisor are significantly different with respect to sex groups (Table 1).

Table 2, showed the results of comparing the means of crown diameter for each sex group with respect to the position of the tooth on each arch.

The t-test is used once again in this instant to detect with significant difference which can be achieved or not. The result of this test revealed that females only showed significant differences between their left and right molars and 1st premolars on the maxilla only. No significant differences were detected on the mandible arch.

Table 1. Comparison of mean crown diameter of the tooth with respect to the arch of the sample individual

Tooth and side	Sex	Arch	Mean± SD	t-test		Range
				T	p-value	
Right Molar	Male	Maxilla	10.499±0.314	2.76	<0.05	9.85-11.17
	Female	Maxilla	10.173±0.679			8.93-12.20
Left Molar	Male	Maxilla	10.530±0.614	-1.94	>0.05	8.99-11.83
	Female	Maxilla	10.800±0.629			8.84-11.86
Right 2nd Prem.	Male	Maxilla	6.738±0.346	2.07	<0.05	6.08-7.70
	Female	Maxilla	6.586±0.310			5.98-7.39
Left 2nd Prem.	Male	Maxilla	6.728±0.312	1.13	>0.05	6.20- 7 .30
	Female	Maxilla	6.655±0.271			6.12-7.27
Right 1st Prem.	Male	Maxilla	7.125±0.340	3.03	<0.05	6.29-7.80
	Female	Maxilla	6.865±0.422			5.76-7.84
Left 1st Prem.	Male	Maxilla	7.123±0.424	-0.23	>0.05	6.19-8.06
	Female	Maxilla	7.145±0.435			6.08-8.19
Right Canine	Male	Maxilla	8.080±0.467	4.60	<0.05	7.04-9.12
	Female	Maxilla	7.646±0.372			7.07-8.61
Left Canine	Male	Maxilla	8.055±0.424	4.17	<0.05	7.29-9.15
	Female	Maxilla	7.677±0.385			6.91-8.76
Right Lat. Incisor	Male	Maxilla	6.959±0.361	1.84	>0.05	6.32-7.97
	Female	Maxilla	6.744±0.645			5.54-8.53
Left Lat. Incisor	Male	Maxilla	6.843±0.346	0.89	>0.05	6.21-7.62
	Female	Maxilla	6.755±0.516			5.92-8.57
Right Cen. Inc.	Male	Maxilla	8.956±0.426	1.70	>0.05	8.23-10.15
	Female	Maxilla	8.794±0.423			7.67-9.83
Left Cen. Inc.	Male	Maxilla	9.044±0.390	2.60	<0.05	8.31-10.15
	Female	Maxilla	8.779±0.516			7.26-9.87

Table 1. Contd.

Tooth and side	Sex	Arch	Mean± SD	t-test		Range
				T	p-value	
Right Molar	Male	Mandible	11.389±0.412	3.55	<0.05	10.49-12.53
	Female	Mandible	10.962±0.639			9.64-12.27
Left Molar	Male	Mandible	11.403±0.470	4.32	<0.05	10.32-12.43
	Female	Mandible	10.946±0.476			9.81-12.40
Right 2nd Prem.	Male	Mandible	7.184±0.439	1.82	>0.05	6.26-8.02
	Female	Mandible	7.013±0.400			6.10-7.97
Left 2nd Prem.	Male	Mandible	7.183±0.433	1.41	>0.05	6.33-8.28
	Female	Mandible	7.046±0.443			6.23-8.32
Right 1st Prem.	Male	Mandible	7.139±0.390	2.82	<0.05	6.23-7.92
	Female	Mandible	6.879±0.434			5.77-7.92
Left 1st Prem.	Male	Mandible	7.129±0.350	3.37	<0.05	6.36-8.17
	Female	Mandible	6.840±0.414			6.10-7.95
Right Canine	Male	Mandible	7.089±0.393	3.53	<0.05	6.37-7.98
	Female	Mandible	6.752±0.458			5.59-7.60
Left Canine	Male	Mandible	7.063±0.406	5.03	<0.05	6.06-7.81
	Female	Mandible	6.612±0.397			5.69- 7.53
Right Lat. Incisor	Male	Mandible	6.155±0.384	1.52	>0.05	5.40- 7.42
	Female	Mandible	6.012±0.455			5.04-6.84
Left Lat. Incisor	Male	Mandible	6.318±0.357	2.31	<0.05	5.69-7.35
	Female	Mandible	6.106±0.457			5.08-7.09
Right Cen. Inc.	Male	Mandible	5.800±0.378	3.00	<0.05	5.08-6.70
	Female	Mandible	5.560±0.333			4.75-6.09
Left Cen. Inc.	Male	Mandible	5.759±0.444	1.23	>0.05	5.00-6.97
	Female	Mandible	5.630±0.493			4.57-6.51

Table 2. Comparison of mean crown diameter of the sample' individuals with respect to the side of the tooth

Maxilla					Maxilla				
Tooth	Sex	Side of the tooth	t-test		Tooth	Sex	Side of the tooth	t-test	
			t	p-value				t	p-value
Molar	Male	Right	-0.28	>0.05	Molar	Male	Right	-0.14	>0.05
		Left					Left		
	Female	Right	-4.28	<0.05		Female	Right	0.12	>0.05
		Left					Left		
2nd Prem.	Male	Right	0.12	>0.05	2nd Prem.	Male	Right	0.01	>0.05
		Left					Left		
	Female	Right	-1.06	>0.05		Female	Right	-0.35	>0.05
		Left					Left		
1st Prem.	Male	Right	0.03	>0.05	1st Prem.	Male	Right	0.12	>0.05
		Left					Left		
	Female	Right	-2.92	<0.05		Female	Right	0.41	>0.05
		Left					Left		
Canine	Male	Right	0.25	>0.05	Canine	Male	Right	0.28	>0.05
		Left					Left		
	Female	Right	-0.36	>0.05		Female	Right	1.46	>0.05
		Left					Left		
Lat. Incisor	Male	Right	1.47	>0.05	L. Incisor	Male	Right	-1.96	>0.05
		Left					Left		
	Female	Right	-0.09	>0.05		Female	Right	-0.92	>0.05
		Left					Left		
Cen. Inc.	Male	Right	-0.97	>0.05	Cen. Inc.	Male	Right	0.44	>0.05
		Left					Left		
	Female	Right	0.14	>0.05		Female	Right	-0.74	>0.05
		Left					Left		

Discussion

The variability in the readings of the crown diameter which is expressed in terms of the standard deviation as well as the range indicates the influence of age, diet, general health status, body size, and many other factors of the individuals considered in this study. This finding is in agreement with that found by LeBlanc, et al., 1974 and Kieser, 1990.

This study -finds that males and females mean crown diameter for some teeth is significantly different. Such a finding is in agreement with Lundstrom, 1969, De Vito C, 1990 and Al-Fahdawi, 2005 when they stated that tooth size proved to be a reliable sex discriminator. In this context molar, 2nd premolar, 1st premolar and canine on the right side of the maxilla and canine and central incisor on the left side of the maxilla and molar, 1st premolar, canine and central incisor on the right side of the mandible and molar, 1st premolar, canine and central incisor on the left side of the mandible can be considered as a discriminator factor for sex at the considered age group (13-19 years) of the individuals of the sample.

The left-right asymmetries of tooth width are considered in this study for each sex group separately. In this context the t-test showed that teeth of male individuals on both sides of maxilla and mandible are similar to

each other and that the differences in the means of crown diameter are considered to be negligible. However, molar and 1st premolar teeth are found to be significantly different on the right and left side of the maxilla of female individuals only, whereas teeth on the both sides of the mandible are proved not to be significantly different for the same sex group. Such results are in agreement with Brook, 1984 and Van Der Weide, et aI., 1994(4,16).

Conclusion

1. Teeth on the left and right side of the maxilla and mandible are similar to each other for male individuals.
2. Teeth on the left and right side of the mandible are similar to each there for female individuals.
3. Left and right side of both molar and 1st premolar are significantly different on the arch of the maxilla for female individuals.
4. Means of crown diameter are found to be significantly different for some teeth when compared with respect to sex groups.

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