Int. J. Morphol.,
26(3):609-614, 2008.

Sexual Dimorphism in Mesiodistal and Bucolingual Tooth Dimensions in Chilean People

Dimorfismo Sexual en las Dimensiones Mesiodistales y Bucolinguales de las Piezas Dentarias en Individuos Chilenos

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SUAZO, G. I.; CANTÍN, L. M; LÓPEZ, F. B.; SANDOVAL, M. C.; TORRES, M. S.; GAJARDO, R. P. & GAJARDO, R. M. Sexual dimorphism in mesiodistal and bucolingual tooth dimensions in Chilean people. ***Int. J. Morphol., 26(3)***:609-614, 2008.

SUMMARY: The study investigates the presence of sexual dimorphism in the size of the permanent teeth among Chilean individuals. Mesiodistal and bucolingual diameters were measured in the teeth of 150 patients between 18 and 24 years old, 67 males and 83 females (excluded were third molars and pieces with large cavities and fillings). The largest were found in males; the differences in mean bucolingual diameters with $p<0.05$ were observed in pieces 1.1, 1.2, 1.3, 1.6, 1.7, 2.6, 3.3, 4.1, 4.2, and 4.5; and with $p<0.01$, the relevant pieces were to 4.4 and 4.7. With regard to mesiodistal dimensions, the only significant difference $p<0.05$ was found in piece 1.2. These results show that sexual dimorphism can be found in all group teeth.

KEY WORDS: Tooth dimensions; Sexual dimorphism; Dental crown; Sex characteristics.

INTRODUCTION

Identification of human remains during mass disasters is hindered by the state of the soft tissue. With relevant expertise, it is carried out on bones and teeth (Ndiokwelu *et al.,* 2003; Slaus *et al*., 2007).

For this reason, forensic dentistry has played an important, often crucial, role in the identification of victims of mass disasters (Van der Kuijl & Van der Pols, 1995; Blau *et al.*, 2006), being useful not only in disasters caused by nature but also under circumstances that bring massive tragedies (Ermenc & Rener, 1999), tsunami (Dawidson, 2007; Petju *et al.*, 2007), fire (Valenzuela *et al.,* 2000), incineration after a car accident (Martin de las Heras *et al*., 1999), air crashes (Brannon *et al*., 2003; Bux *et al.*, 2006), and rail disasters (Solheim *et al*., 1992), among others.

The dentition is often preserved, even when the bony structures of the body are destroyed because of its physical characteristics and the protection it gets from the bone jaw. It has the ability to resist, better than any other skeletal structure, the destructive action of the medium in which they are found (Toribio & Soto, 1995). For this reason, the use of dental morphology to determine sexual dimorphism is a procedure established in anthropological and biological studies (Edgar, 2005).

The existence of sexual dimorphism in permanent teeth is a known phenomenon, as observed in several investigations (Jensen *et al.,* 1957; Kondo & Townsend, 2004). This behavior morphogenetically determined that the shape and dimensions of the tooth are fairly stable and has been seen as a determining factor in providing sexual dimorphism in skeletal remains, which is required for forensic identification purposes (Rodríguez, 2004).

The variation in odontometry is especially important to determine the influence of sexual dimorphism on the size of the teeth (Ruiz, 2004). The presence of significant differences between the upper canine and the lower lateral incisor has been described; the mesiodistal diameter is greater for both pieces in males than in females (Pettenati-Soubayroux *et al.*, 2002).

The size of the teeth is of great importance not only to indicate the different activities related to the occlusion or determine the frequency of dento-tooth anomalies applied

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to the orthodontic treatment, but also to establish sexual dimorphism (Buthz & Ehrhardt, 1938). This, therefore, will have a great significance in forensic medicine. Because of this, the knowledge of coronary dimensions for the identification of sex when skeletons are found becomes relevant, especially when anatomical parameters are not reliable for identifying a particular subject. This would decrease getting the number of wanted individuals to a probability of 50%, which, together with information obtained from a clinical registration document (done during rehabilitative treatment for each patient), can result in a more accurate way of identifying the person sought.

Gómez (2005) analyzed a sample of 86 adult Colombians and determined increased sexual dimorphism in the canines. Similar results have been obtained by various researchers (Evan, 1994; Rodríguez, 2003).

Most of the studies have been conducted by measuring the mesiodistal and bucolingual diameters in permanent teeth. Kondo & Townsend included temporal molar teeth in a study demonstrating that it was also possible to identify sexual dimorphism in them.

We analyze the presence of sexual dimorphism in mesiodistal and bucolingual size in the crowns of permanent teeth.

Table I. Statisticians descriptive mesiodistal and bucolingual diameters of the maxillary teeth of 150 males and females between 18 and 24 years.

			Mesiodistal			Bucolingual		
Tooth	Gender	N	Mean	SD	Sig.	Mean	SD	Sig.
1.7	Male	66	10.0062	.74872	.234	11.3859	.68071	.001*
	Female	77	9.8291	.98408		10.9927	.63676	
1.6	Male	62	10.6784	.73422	.093	11.4080	.77397	.010*
	Female	79	10.4761	.68209		11.1157	.58303	
1.5	Male	62	7.0965	.90884	.420	9.5805	.70600	.343
	Female	79	6.9629	1.01901		9.4654	.72221	
1.4	Male	55	7.0560	.70770	.259	9.5162	.78887	.119
	Female	71	6.9172	.66066		9.2907	.79735	
1.3	Male	67	8.0488	.62420	.177	8.3651	.88795	.026*
	Female	82	7.9113	.60871		8.0587	.78130	
1.2	Male	66	7.1021	.70753	.024*	6.719	.7851	.018*
	Female	81	6.8502	.63383		6.400	.8197	
1.1	Male	66	8.6927	.73973	.071	7.1748	.74135	.019*
	Female	83	8.4707	.74266		6.9022	.65968	
2.1	Male	66	8.6939	.64982	.199	7.1892	.75498	.346
	Female	83	8.5437	.74805		7.0743	.72853	
2.2	Male	67	6.9455	.57821	.397	6.6487	.74567	.074
	Female	81	6.8504	.75118		6.4173	.81136	
2.3	Male	67	7.9243	.61450	.407	8.128	.9701	.185
	Female	83	7.8360	.67230		7.940	.7563	
2.4	Male	54	7.2283	.60851	.174	9.448	.8720	.111
	Female	71	7.0800	.59415		9.210	.7856	
2.5	Male	62	6.9490	.70100	.175	9.5540	.91451	.154
	Female	79	6.7851	.71388		9.3352	.88877	
2.6	Male	62	10.3897	.88912	.547	11.4069	.85932	.033*
	Female	81	10.3052	.78168		11.1223	.73839	
2.7	Male	66	9.8373	.82406	.897	11.4338	.94515	.058
	Female	80	9.8548	.80418		11.1762	.67659	

* The statistical significance was found with a p-value <0.05.

MATERIAL AND METHOD

A descriptive study was conducted through cross-sectional anthropometry indirectly. Without random sampling, for convenience, were recruited 150 patients between 18 and 24 years of age (mean 21.5 years, SD 1.31), 67 males and 83 females. Plaster models of the maxillary and mandibular arches from alginate impressions in these patients were obtained.

The models were numbered according to sex of the individual. The measurements excluded teeth with extensive cavities, fillings involving free and/or proximal surfaces, pieces with position anomalies, and third molars.

Using a digital caliper (0.01 mm), we determined mesiodistal and vestibulolingual diameters of each permanent tooth following procedures described by Moorrees & Reed (1964).

The measurements were made by two operators, "blinded" as to the sex of the individual information corresponding to the model, and through the method of re-measurement, a random sample was calculated to find interobserver correlation coefficient.

Using the SPSS 11.5 software for Windows, descriptive statistics were obtained from the sample. The statistical significance of differences in mean in mesiodistal and bucolingual diameters between males and females was calculated using the t test for independent samples with $p < 0.05$.

Table II. Statisticians descriptive mesiodistal and bucolingual diameters of the mandibular teeth of 150 males and females between 18 and 24 years.

			Mesiodistal			Bucolingual		
Tooth	Gender	N	Mean	SD	Sig.	Mean	SD	Sig.
1.7	Male	66	10.0062	.74872	.234	11.3859	.68071	.001*
	Female	77	9.8291	.98408		10.9927	.63676	
1.6	Male	62	10.6784	.73422	.093	11.4080	.77397	.010*
	Female	79	10.4761	.68209		11.1157	.58303	
1.5	Male	62	7.0965	.90884	.420	9.5805	.70600	.343
	Female	79	6.9629	1.01901		9.4654	.72221	
1.4	Male	55	7.0560	.70770	.259	9.5162	.78887	.119
	Female	71	6.9172	.66066		9.2907	.79735	
1.3	Male	67	8.0488	.62420	.177	8.3651	.88795	.026*
	Female	82	7.9113	.60871		8.0587	.78130	
1.2	Male	66	7.1021	.70753	.024*	6.719	.7851	.018*
	Female	81	6.8502	.63383		6.400	.8197	
1.1	Male	66	8.6927	.73973	.071	7.1748	.74135	.019*
	Female	83	8.4707	.74266		6.9022	.65968	
2.1	Male	66	8.6939	.64982	.199	7.1892	.75498	.346
	Female	83	8.5437	.74805		7.0743	.72853	
2.2	Male	67	6.9455	.57821	.397	6.6487	.74567	.074
	Female	81	6.8504	.75118		6.4173	.81136	
2.3	Male	67	7.9243	.61450	.407	8.128	.9701	.185
	Female	83	7.8360	.67230		7.940	.7563	
2.4	Male	54	7.2283	.60851	.174	9.448	.8720	.111
	Female	71	7.0800	.59415		9.210	.7856	
2.5	Male	62	6.9490	.70100	.175	9.5540	.91451	.154
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2.7	Male	66	9.8373	.82406	.897	11.4338	.94515	.058
	Female	80	9.8548	.80418		11.1762	.67659	

* The statistical significance was found with a p-value <0.05, ** p <0.01

RESULTS

Most of the mesiodistal and bucolingual dimensions of the maxillary and mandibular tooth crowns were higher in males, with the exception of mesiodistal diameters in teeth 2.7, 3.6, 3.5, and 3.1 and the bucolingual diameters of 3.7, 3.2, and 4.6, which were found higher in females. These differences, however, were not significant.

As to differences in bucolingual diameter, they were significantly higher in males with $p < 0.05$ for teeth 1.1, 1.2, 1.3, 1.6, 1.7, 2.6, 3.3, 4.1, 4.2, and 4.5 and, at $p < 0.01$, for teeth 4.4 and 4.7. With regard to the mesiodistal dimensions, the only significant difference ($p < 0.05$) was found in tooth 1.2 this was higher in males than in females.

Table I shows the descriptive statistics and significance of differences in the mesiodistal and bucolingual diameters of the maxillary teeth. In Table II are observed the results for the mandibule teeth. We found a high correlation between the observations, k=0.98.

DISCUSSION

The presence of sexual dimorphism in the size of the temporary and permanent teeth is a fact well-documented in humans and primates (Garn *et al.*, 1967; Garn *et al.,* 1977; Scott & Turner, 1997; Kondo *et al.,* 1998; Kondo & Townsend; Kondo *et al.*, 2005; Teschler-Nicola, 1992; Wood *et al.,* 1991).

Most studies indicate that the mandibule canine is the tooth that presents greater dimorphism, followed by the first and second maxillary molars (Acharya & Mainali, 2007; Kondo *et al.*, 1998; Kondo *et al*., 2005; Ling & Wong, 2006). In our work, the significant differences were found mainly in bucolingual diameters, but theyincluded various teeth of all dental groups, the largest being found in teeth 4.4 and 4.7, these results are similar to those reported by Ruiz in a Chilean population similar to this study, which reinforces the arguments (Alt *et al*., 1998) that changes in dental dimensions are influenced by ethnic factors.

It is worth noting that no significant differences in the mesiodistal diameter of the analyzed teeth were found; Stanley *et al.* (1966) described the presence of sexual dimorphism in mesiodistal diameter of permanent teeth among Caucasians, but that the dimorphism percentage was higher in terms of bucolingual dimensions.

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RESUMEN: Se investiga la presencia de dimorfismo sexual en las dimensiones de las piezas dentarias permanentes, en individuos chilenos. Se midieron los diámetros mesiodistales y bucolinguales de las piezas dentarias de150 pacientes, de entre 18 y 24 años de edad, 67 hombres y 83 mujeres, se excluyeron los terceros molares y las piezas con caries y obturaciones extensas. Las mayores dimensiones se encontraron en hombres, diferencias significativas en los diámetros bucolinguales con $p<0.05$ resultaron en las piezas 1.1, 1.2, 1.3, 1.6, 1.7, 2.6, 3.3, 4.1, 4.2 y 4.5 y con $p<0.01$ para las piezas 4.4 y 4.7. Con respecto a las dimensiones mesiodistales, la única diferencia significativa con $p<0.05$ se encontró en la pieza 1.2. Estos resultados muestran que es posible encontrar dimorfismo sexual en todos los grupos dentarios.

PALABRAS CLAVE: Dimensiones dentales; Dimorfismo sexual; Corona Dental; Características sexuales.

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Received: 14-02-2008
Accepted: 21-06-2008