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Evaluation of sexual dimorphism in the permanent dentition by maxillary first molar

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Abstract---Background: The present study was conducted for assessing Sexual Dimorphism in the Permanent Dentition by maxillary first molar. Materials & methods: 20 subjects were analysed among which 10 were males while the remaining 10 were females. All the subjects belonged to the age range of 18 to 28 years. Only those subjects were enrolled who reported for orthodontic treatment and had fully erupted maxillary and mandibular first molars. The subjects fulfilling the inclusion criteria were subjected to impression making of the maxillary arch with irreversible hydrocolloid (alginate) material and casts poured immediately in type II dental stone to minimize dimensional change. Measurement of buccolingual (BL) and mesiodistal (MD) width of the maxillary first molar (16) was done by vernier calliper both intra-orally and on study casts. Results: Statistically maxillary permanent first molars showed the nonsignificant difference; thus, they are a better predictor for gender dimorphism. Conclusion: The permanent maxillary first molars is suggestive of a better predictor of sexual dimorphism.

Keywords---permanent, sexual, dimorphism.

Introduction

Sex determination is considered an important step in reconstructing the biological profile of unknown individuals from the forensic context. The most commonly used techniques are based on the assessment of the morphological characteristics of the pelvis and skull. However, it is not uncommon to recover the pelvis and the skull in a fragmentary state in forensic settings. In this case, teeth can be used as an additional tool for sex determination as they are very resilient to destruction and fragmentation in comparison with skeletal tissues. Metric and non-metric analyses of the human dentition have played an important role in human biological research and have formed a central focus in the field of dental anthropology for over a century.¹⁻³

Most studies of sexual dimorphism in tooth size are based on the measurement of the mesiodistal and buccolingual crown diameters. However, a number of other studies have used alternative measurements such as the mesiodistal and buccolingual cervical and diagonal diameters of teeth. In addition, some investigations have examined the distances of molar cusps, while some more recent research has focused on studying crown tissue measurements since it has been proved that tooth formation and tissue proportions are highly regulated by sex-linked genes.⁴⁻⁶

Sexual dimorphism in crown morphology and size of the permanent dentition is the result of the different amount of enamel, dentin, and pulp tissue between males and females. A number of investigations have established that sexual dimorphism exists in the permanent dentition of humans particularly in the canines, which exhibit the greatest degree of difference.⁶⁻⁸ Hence; the present study was conducted for assessing Sexual Dimorphism in the Permanent Dentition of a known population.

Materials & Methods

We planned the current research with the aim of establishing the role of maxillary permanent first molar in Sexual Dimorphism. 20 subjects were analysed among which 10 were males while the remaining 10 were females. All the subjects belonged to the age range of 18 to 28 years. Only those subjects were enrolled who reported for orthodontic treatment and had fully erupted maxillary and mandibular first molars. The subjects fulfilling the inclusion criteria were subjected to impression making of the maxillary arch with irreversible hydrocolloid (alginate) material and casts poured immediately in type II dental stone to minimize dimensional change. Measurement of buccolingual (BL) and mesiodistal (MD) width of the maxillary first molar (16) was done by vernier calliper both intra-orally and on study casts. Measurement was done twice for avoiding observer bias. All the results were recorded and analysed using SPSS software.

Results

Statistically maxillary permanent first molars showed the nonsignificant difference; thus, they are a better predictor for gender dimorphism. The

comparison of mesiodistal width and buccolingual width of both genders measured intraorally, and on study cast showed that a highly significant correlation was found on intraoral measurements.

Table 1: Comparison of mesio-distal and bucco-lingual variables of 16 measured on intra-orally and casts

Gender	Mesio-distal		p- value	Buccolingual		p- value
	IO	Cast		IO	Cast	
Males	9.92	10.08	0.85	11.08	11.25	0.25
Females	9.79	9.91	0.46	10.88	11.05	0.12
Overall	9.83	9.99	0.36	10.99	11.13	0.82

IO: Intra-orally

Discussion

Sex determination is considered an important step in reconstructing the biological profile of unknown individuals from a forensic context. Forensic anthropologists have long used teeth as an additional tool for sex determination as they resist postmortem destruction. This is possible because the enamel is the hardest tissue of the human body and has a high capacity to preserve itself even in extreme conditions of pH, moisture, salinity and high temperatures, which is recognized in the archaeological taphonomic field as resistance, that dental morphology is expressed to be genetically unique and unrepeatable in each tooth.^{6- 10} Sexual dimorphism refers to those differences in size, stature and appearance between male and female that can be applied to dental identification because no two mouths are alike. Gender determination always plays a pivotal role in solving medico-legal cases as well as in anthropological studies. Sex may be determined from various parts of the body like the skull remains, bones etc., Teeth are considered as the strongest structure since they are resistant to mechanical, chemical, physical thermal effects microbial degradation and other post mortem insults. Gender determination using dental features is primarily based upon the comparison of tooth dimensions in males and females, or upon comparing the non-metric dental traits. Morphometrics plays an important role in determining the gender in cases of major catastrophes when the bodies are often damaged beyond recognition. Tooth size standards based on odontometric investigations can be used in age and sex determination as human teeth exhibit sexual dimorphism.^{9- 11} Hence; the present study was conducted for assessing Sexual Dimorphism in the Permanent Dentition of a known population.

In the present study, statistically maxillary permanent first molars showed the nonsignificant difference; thus, they are a better predictor for gender dimorphism. The comparison of mesiodistal width and buccolingual width of both genders measured intraorally, and on study cast showed that a highly significant correlation was found on intraoral measurements. In a study conducted by Zorba E et al, examined the degree of sexual dimorphism in permanent teeth of modern Greeks. A total of 839 permanent teeth in 133 individuals (70 males and 63 females) from the Athens Collection were examined. Mesiodistal and buccolingual crown and cervical diameters of both maxillary and mandibular teeth were measured. It was found that males have bigger teeth than females and in 65 out

of 88 dimensions measured, male teeth exceeded female teeth significantly ($P < 0.05$). Canines were the most dimorphic teeth followed by first premolars, maxillary second premolar and mandibular second molar. Although other teeth were also sexually dimorphic they did not have a statistically significant difference in all dimensions. The most dimorphic dimension was buccolingual cervical diameter followed by buccolingual crown diameter. A comparison of sexual dimorphism in teeth between different populations showed that it differs among different groups. European population groups presented the highest degree of sexual dimorphism in teeth whereas Native South Americans the lowest.¹¹

Sonika V et al evaluated the existence of sexual dimorphism in maxillary first molars. The base sample comprised 200 subjects (100 males and 100 females) aged 17–25 years. The buccolingual (BL) and mesiodistal (MD) diameters of maxillary first molars were measured using digital vernier calipers both intraorally and on study casts. Results showed statistically significant sexual dimorphisms in male and female odontometric features. The mean values of the parameters were greater on the left side than on the right side. Amongst the intraoral group, the right maxillary first molar was found to exhibit the greatest sexual dimorphism (5.34%) in terms of buccolingual dimension. Amongst the study cast group, the left maxillary first molar was found to exhibit the greatest sexual dimorphism (5.54%) in terms of buccolingual dimension. The buccolingual dimensions exhibited greater sexual dimorphism than mesiodistal dimensions. Sex determination from an incomplete skeleton or young children may be difficult and, in such situations, the odontometric features of the teeth can be of immense help in determining the sex.¹²

Conclusion

The permanent maxillary first molars is suggestive of a better predictor of sexual dimorphism.

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