

Research article

Gender Determination by Linear Dimension of Permanent Canine: An Odontometric Analysis

Sharma B¹, Balaji N², Sumathi MK³

Department of Oral Pathology & Microbiology
Teerthanker Mahaveer Dental College and Research Centre, Bagarpur, Moradabad

¹MDS Final year student, Department of Oral Pathology & Microbiology, Teerthanker Mahaveer Dental College

²HOD, Department of Oral Pathology & Microbiology, Teerthanker Mahaveer Dental College

³Reader, Department of Oral Pathology & Microbiology, Teerthanker Mahaveer Dental College

ABSTRACT

Background and objectives: Identification, an aspect of forensic anthropology, is the recognition of an individual based on the physical characteristics unique to the individual. Among the four main attributes i.e. gender, age, stature and ethnic or racial background of an individual's biological identity, sex determination is usually the first step in the human identification process. Teeth can be used as a means of sex determination as teeth are resistant to post-mortem degradation and survive deliberate, accidental or natural change. This study was carried out with an objective to determine the sexual dimorphism of maxillary and mandibular canine by linear tooth diameter for permanent dentition in Moradabad population.

Material and Methods: A total number of 40 subjects (20 Males and 20 Females) were included in this study. After obtaining an informed written consent, alginate impression was taken with help of perforated impression trays and study models were prepared with type IV dental stone. Linear (MD, BL, Crown Height) were taken with digital vernier caliper.

Results: It was observed that males' shows more mean linear crown diameter as compared to females. Also, the mesiodistal and buccolingual measurement shows statistically significant difference for all canines, being higher for males than females.

Conclusion: The present study has expressed sexual dimorphism of permanent canine using Student's test and indicate that linear dimension of maxillary canine can be used for sexual dimorphism with accuracy along with other accepted procedure for sex determination.

Keywords: Sex determination, linear tooth measurement, Permanent dentition.

INTRODUCTION

The Teeth are the excellent material for genetic, odontologic and forensic

investigation and research especially in cases when, the skeletal remains are poorly preserved^{1,2}. Sex determination using dental

features is primarily based upon the comparison of tooth dimensions in males and females, or upon the comparison of frequencies of non-metric dental traits, like Carabelli's trait of upper molars, deflecting wrinkle of lower first molars, distal accessory ridge of the upper and lower canines or shoveling of the upper central incisors^{3,4,5}. Sexual dimorphism refers to the differences in size, stature, and appearance between male and female⁴. This can be applied to dental identification also because no two mouths are alike. Various features like tooth morphology and crown size show variation in male and female. Most commonly used odontometric dimension for sex determination are linear measurement (Mesiodistal and buccolingual) and dental indices⁶. With this approach, numerous authors have studied intensively sexual dimorphism present in teeth by means of odontometric analyses, and most studies have showed statistically significant difference in the permanent dentition. Thus this study aimed to analyse the degree of sexual dimorphism in permanent maxillary and mandibular canine in Moradabad population using odontometric technique.

MATERIALS AND METHODS

After taking an informed written consent from the subjects, a total number of 40 subjects visiting the outpatient Department of Teerthanker Mahaveer Dental College and Research Centre were taken. Subjects were categorized two groups:

Group A (20 Males) and

Group B (20 Females).

Inclusion Criteria

- Age 16 to 25 yrs

- All fully erupted sound permanent teeth up to second molar
- Peridontally healthy teeth
- No history of orthodontic treatment.

Maxillary and Mandibular impression of all subjects were made with alginate using impression trays and study models were prepared with dental stone type-IV using base former. Study models were coded. Study models were analyzed for linear measurement (mesiodistal width, buccolingual width and crown height) for maxillary and mandibular canine using a digital vernier caliper. Odontometric measurements were taken using the following parameters as guide:

Mesio-Distal (MD) measurements: Is defined as the distance (in mm) between two parallel planes, tangential to the most mesial and the most distal points of the crown sides.

Bucco-Lingual (BL) measurements: Is defined as the greatest distance (in mm) between two parallel planes, one tangential to the most lingual /palatal point of the crown side and other tangential to a point on buccal /labial crown side.

Crown Height (CH): Defined as greatest distance between cervical line to incisal edge or cusp tip of the anatomical crown.

Statistical analysis: The data obtained was statistically analysed using the SPSS (Version 7.0) and test of proportion was used for the analysis.

RESULTS

Table 1: Mean and standard deviation of linear tooth measurement for maxillary and mandibular canine

Parameter	Tooth	Gender		p-value
		Male Mean± SD	Female Mean± SD	
Mean MD	13	7.66±0.48	7.32±0.34	< 0.001
	23	7.51±0.38	7.14±0.34	
	33	6.88±0.42	6.48±0.36	
	43	6.68±0.42	6.46±0.34	
Mean BL	13	8.22±0.64	8.14±0.64	< 0.001
	23	8.20±0.64	8.10±0.64	
	33	7.66±0.64	7.24±0.52	
	43	7.64±0.64	7.14±0.54	
Mean CH	13	6.88± 0.32	6.18± 0.33	< 0.001
	23	6.86± 0.30	6.16±0.36	
	33	7.42± 0.22	7.12±0.38	
	43	7.36± 0.26	7.14±0.22	

SD, standard deviation; MD, Mesio-Distal; BL, Bucco-Lingual; CH, Crown Height

Table 2, express the comparison of dimensions of the MD and BL measurement in the present study in relation to other studies. From present study it was observed that males shows more mean linear crown diameter as compared to females.

DISCUSSION

Teeth provide excellent models for the study of relationship between ontogeny and phylogeny and dentist is the only person who can accumulate, correlate and evaluate this biomechanical information⁵. The general

Table 2: Difference between averages of mesiodistal (MD) and buccolingual (BL) measurements of present study and other population

Authors	Population	Tooth	Male		Female	
			MD	BL	MD	BL
Pettential-Soubayroux,2002	French	13&23 33&43	7.79 7.01	- -	7.06 6.70	- -
Iscan; Kedici 2003	Turks	13&23 33&43	- -	8.61 8.04	- -	7.78 7.19
Ling;Wong,2007	Chinese	13&23 33&43	8.30 7.31	8.09 7.20	7.92 6.89	7.84 7.04
Astete;San Pedro;Suazo 2009	Spanish	13 23	8.49 8.60	8.53 8.43	8.18 8.14	7.84 7.84
Prabhu; Acharya 2009	Indian	13&23 33&43	7.65&7.59 6.69&6.61	8.12&8.06 7.32&7.38	7.44&7.39 6.39&6.45	7.75 7.00&7.03
Pereira et al 2010	Portuguese	13&23	8.17 8.03	8.59 8.54	7.74 7.46	7.93 7.85
Yuri Trigueiro et al 2012	Brazilian	13&23 33&43	8.17&8.07 6.98&6.69	8.59&8.54 7.73&7.70	7.46&7.45 6.48&6.47	7.93 7.89
Present Study 2014	Indian (Moradabad)	13&23 33&43	7.66&7.51 6.68&6.88	8.22&8.20 7.66&7.64	7.32&7.14 6.48&6.46	8.14&8.10 7.24&7.14

Table1 presents the mean and standard deviation for MD, BL and CH according to tooth and sex. Statistically significant difference is indicted by student’s t-test for maxillary and mandibular canine (p < 0.001) in males and females. No statistically significant difference was found in right and left side, either in upper or lower arches.

structure and morphology of the teeth are similar in both men and women, however there are subtle differences, such as variation in dental size, that can give a clue about differences between the sexes⁷. Following this pattern, teeth can be considered an important step for sex determination as they are resistant to postmortem destruction and fragmentation.

Mesiodistal and Buccolingual dimension: In present study, we found that the mesiodistal and buccolingual measurement shows statistically significant difference for all canines, being higher for males than females. It was observed that males show more mean linear crown diameter as compared to females.

The mean MD width 7.66mm (right side) and 7.51 (left side) in males, while it was 7.32 mm (right side) and 7.14 mm (left side) in females. The mean BLW was 8.22 mm (right) and 8.20 mm (left) in male. In females it was 8.41 mm (right) and 8.10 mm (left). These results are consistent with previous studies done by Schwartz and Dean and Saunders, Chan, Kahlon et al as they reported that males have larger teeth than females. A study performed by Pereira et al in Portuguese population reveals that the mesiodistal dimensions are higher in Portuguese population than Indian population⁷. According to Agnihotri and Sikri, the mean mesio-distal width (11.33mm), buccolingual width (12.53mm) for males are higher in comparison to females (10.88 mm and 11.97 mm) in a Indian population^{8,9,10}. In the present study the crown height of mandibular canine is more in female in comparison to males. Several studies have investigated the possible reasons for the morphological and developmental difference in teeth between men and women. Animal model studies suggested that specific genetic factors might be involved with specific types of tooth development. According to Schwartz and Dea, sex hormone concentrations during development could relate to dental tissue proportions in teeth forming at different moments. Garen et al reported that genetic influence tends to keep low /high magnitude dimorphism in interrelated racial groups originating from the same geographical

region. That may explain the difference between the tooth size in the diverse population^{11,12}.

CONCLUSIONS

Forensic odontology in India is an emerging field and relies a lot on inexpensive and easy means of identification of persons from fragmented jaws and dental remains. The advantages in determining sex on basis of odontometric features are simplicity, speed and low cost. Tooth size standards based on odontometric investigations are population specific and have shown varying degree of sexual dimorphism. The present study has expressed sexual dimorphism of permanent canine using Student's test and indicate that linear dimension of maxillary canine can be used for sexual dimorphism with accuracy along with other accepted procedure for sex determination.

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