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SEXUAL DIMORPHISM IN MANDIBULAR CANINE INDEX (MCI) FOR WESTERN UTTAR PARDESH (ALIGARH) POPULATION

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ABSTRACT

Introduction: Identification of living persons and the dead bodies is an important aspect of forensic medicine. Establishing sex of an individual is one of the important aspects of establishing identity of an individual. Sexual dimorphism exists in the dimensions of teeth and inter-arch widths specially inter canine width. Among all teeth mandibular canines show maximum sexual dimorphism and can be used to determine the sex of an individual. **Aims and Objective:** To evaluate the sexual dimorphism in mandibular canine index for a North Indian population and validate its use in forensic science in determining sex of an unknown individual. **Material and Method:** 150 individual (75 males and 75 females) as per inclusion criteria were included in our study. Alginate impressions were made for madibular arch. Study cast were made with dental stone and inter canine width and mesio-distal width were recorded using manual vernier caliper. **Results:** Data obtained were subjected to paired t test. The level of accuracy in gender determination was found to be 79% for right mandibular canine index and 75% for left mandibular canine index. **Conclusion:** Mandibular canine index is a quick, easy and reliable indicator of sex of an unknown individual. If population specific formula is available it can be used as an adjunct for other methods of sex determination.

KEY WORDS: sexual dimorphism, mandibular canine index, mrsio-distal width of canine; inter canine distance.

INTRODUCTION

Teeth are an excellent material in living and non-living populations for anthropological, genetic, odontologic and forensic investigations. These exhibit the least turnover of natural structure and are readily accessible for examination. Being the hardest and chemically the most stable tissues in the body they are selectively preserved and fossilized, thereby providing by far the best record for evolutionary change. Their durability in the face of fire and bacterial decomposition makes them invaluable for identification.[1]

Determination of sex of unidentified individual is an important aspect of identification of an individual. If the sex of an individual could be determined it makes the identification of missing individual simpler. Because, in such situation individual of only one sex need to be considered.

Studies have been done by many researchers to establish the sexual dimorphism in the dimensions of teeth and inter arch width. Out of all teeth mandibular canine showed maximum sexual dimorphism. Variation in dimensions of teeth occur due to difference in thickness of dentin.

The ratio of mesio-distal width of canine and inter canine distance is known as mandibular canine index. Study done by various researchers on mandibular canine index for different population has showed significant sexual dimorphism. With this background a study has been done for a North Indian population.

MATERIAL AND METHOD

150 individuals (75 males and 75 females) between the age group of 18-25 yrs visited to department of Oral Pathology/Oral Medicine and Radiology of Z.A. Dental College belonging to Aligarh were included in our study. Individuals with normal over jet over bite, absence of spacing and with class I molar and canine relationship were included in our study. However patient with severe attrition of teeth, partially erupted teeth and deleterious habits were excluded from our study.

Informed consent was obtained from patients. Alginate impression was made for mandibular arch. Study casts were prepared with dental stone. Mesio-distal widths of mandibular canine (both right & left) were recorded on study cast using vernier caliper [Figure 2 &3]. Inter canine distance was also recorded using vernier caliper [Figure 1]. Data obtained was subjected to statistical analysis.

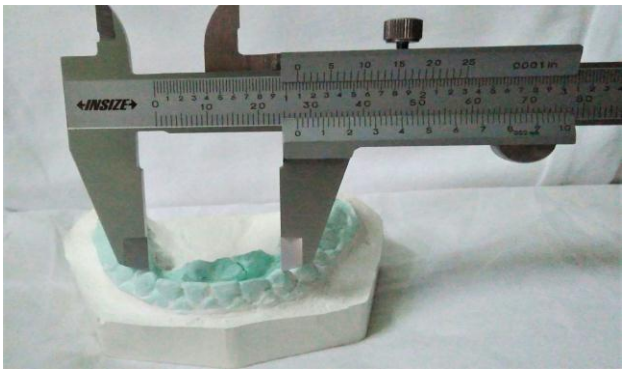

Figure 1: measurement of inter canine distance

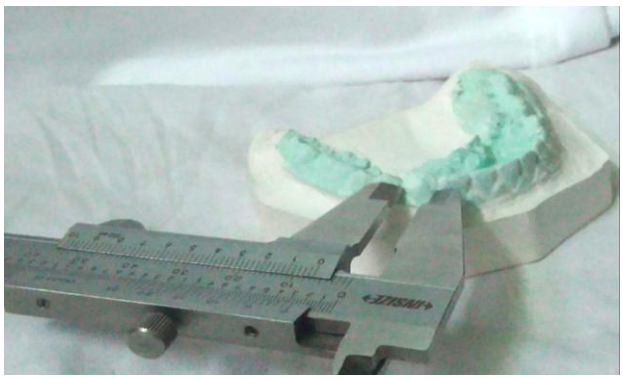

Figure 2 &3: measurement of mesio-distal width of right and left mandibular canine.

Formulae for

Observed canine index = Mesio-Distal Width of Canine/Inter Canine Distance

Standard Mandibular Canine Index (MCIs) = (Mean male MCI- SD) + (Mean female MCI + SD)/2

RESULTS

Statistica software was used for biostatical analysis. Data obtained was subjected to paired't' test analysis to determine the level of accuracy of gender determination using mandibular canine index.

Table 1

Parameters	Sex	Mean	±SD	't' value	'p' value	Significance
Inter canine distance	M	27.31	1.63	2.10	0.01	Significant
	F	26.20	1.37			
M-D width of Right canine	M	6.98	0.56	4.20	0.00	Significant
	F	6.50	0.39			
M-D width of Left canine	M	7.02	0.56	4.98	0.00	Significant
	F	6.40	0.37			
Right MCI	M	0.255	1.64	2.77	0.02	Significant
	F	0.248	1.43			
Left MCI	M	0.257	1.74	3.67	0.00	Significant
	F	0.244	1.45			

Standard MCI (Right of mandible) = 0.242

Standard MCI (Left side of mandible) = 0.219.

Table 2

Sex	Right mandibular MCI		Left Mandibular MCI	
	Number	Percentage	Number	Percentage
Male	62	82.67	58	77
Female	57	76	55	73

Tabel 3

Over all percentage of accuracy	Right Mandibular Canine Index	Left Mandibular Canine Index
	79	75

DISCUSSION

Identification of living as well as the dead using skeletal remains and dentition is of paramount importance in routine forensic practice. The only method that can give the most accurate result is DNA technique, but it cannot be employed in all cases. Teeth being hardest and chemically the most stable tissue in the body are selectively preserved and fossilized, thereby providing the best record for evolutionary change and forensic investigation. Their durability in the phase of fire and bacterial decomposition makes them invaluable for identification of age, sex and race based on odontometric parameters.[4]The dentition takes precedence particularly when preferred parameters such as the pelvis are unavailable and cranial and long bones fragmentary.[6]

Study done by Andrea Dario Messina et al stressed on the importance of odontometric analysis as an additional methodology, which is quick and easy to use, for sex determination of skeletal remains in archaeological contexts and in forensics-as in the case of mass disasters-where identification of individuals is not possible by standard methods.[10]

Lund and Mornstad studied 58 dental casts of Swedish subjects and found canines to be most dimorphic.[11] Lysell and Myrberg in an extensive study on more than 1000 individuals and concluded that mandibulr canine showed maximum sexual dimorphism.[12]

The mandibular canines have a mean age of eruption of 10.87 years and they are the last teeth to be extracted with respect to age. They are less affected by periodontal diseases and are most likely to survive severe trauma such as air disasters, hurricanes or conflagration. These findings indicate that mandibular canines can be considered as the 'key teeth' for personal identification.[5]

Studies have shown that dimensions of canines shows maximum dimorphism because of the influence of the Y-chromosome that controls the thickness of dentin and is not uniform in all teeth[8.] Dimorphism in permanent tooth size, favouring males over females, ranges between 2.5 and 9%; sex differences are greatest for the canines, particularly the mandibular canine.[13]

Apart from that the variation in the magnitude of dimorphism can be a result of various factors, and one such factor is environmental influences on tooth size. Variation in food resources exploited by different populations has been explained as one such environmental cause. Others have suggested the interference of cultural factors with biological forces, secular changes, and bilateral asymmetry. There can be a complex interaction between a variety of genetic and environmental factors that are responsible for the variation in the magnitude of dimorphism.[9]

Our study establishes the existence of a definite statistically significant sexual dimorphism in mesio-distal mandibular canine dimension and inter-canine distance [Table 1]. In our study right mandibular canine index was 79% and left mandibular canine index was 75% accurate in gender determination [Table 3]. This finding of ours was in disagreement with the study done by Kaushal et al.[1] This difference may be attributed to the fact that the size of the tooth in male and female depends upon the function, environment and the culture of individual.

In our study mean value of mandibular inter canine distance was less for female than male [Table 1]. This was similar to the study conducted by P.C. Ibeachu et al[2] and Bindu Aggarwal et al.[3]

But this method of sex determination has its own limitations. The sex of the subject can be determined at best if the fragment is found in the geographical area where the subject was born. Besides this implies that it is necessary to make a random sample of the population from this geographical area to calculate the corresponding standard mandibular canine index as we have attempted in our study for individual belonging to Aligarh.

CONCLUSION

Mandibular canine index is a quick and reliable method for sexual identification when a standard for the population is available. The accuracy of sex determination using the long bones and skull bone is approximately 85 and 93% .[7] But in none of the studies mandibular canine index has reached up to 90% in sex identification. So it can only be used as a supplementary tool in sex identification of an individual with other parameters

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