

Mandibular Canine Index as a Tool for Sex Determinant

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Abstract

Objective: Various methods are used for gender identification in forensic investigations. The canine tooth is widely used for gender determination because of its sexual dimorphism and durability in the oral cavity. Mandibular canine index (MCI) is one of the most reliable predictor for gender identification. The purpose of this study was to assess the reliability of MCI in gender determination.

Materials and Methods: The present study was conducted on 100 students (50 Male, 50 Female). Vernier caliper and divider for measurement of mesiodistal width of canines and intercanine distance (canine arch width) were used. We measured mesiodistal width of mandibular canines and intercanine distance (canine arch width). From these parameters, we statistically found canine index & sexual dimorphism.

Results: When values for both males and females were measured and compared, males showed greater mean dimensions of teeth than females, and results were statistically significant. In the present study, most sensitive predictors for gender determination from canine were mandibular canine width and canine index.

Conclusions: Study revealed that MCI can be used a reliable predictor for gender determination.

Keywords: Canine indices, mandibular canine, forensic dentistry, sex determination.

Introduction

Gender determination is the first and foremost task in any kind of forensic investigation of unidentified bodies and skeletal remains. Gender determination using dental features is mainly based upon the comparison of tooth dimensions in males and females. Canines are least frequently extracted teeth, being less affected by periodontal disease. Mesiodistal diameter of mandibular and maxillary canines provides evidence of sex determination due to dimorphism.¹ According to Black, tooth size standards based on odontometric investigations can be used in age and sex determination.² Whenever it is possible to predict the sex, identification is simplified because then only missing persons of one sex need to be considered. In this sense identification of sex takes precedence over age.³ Canines are also better likely to survive severe trauma such as air disasters, hurricanes or conflagration. These findings indicate that canines can be considered as the 'key teeth' for personal identification.⁴ Anderson D.L. and Thompson G.W. investigated the inter relationship and sex difference of dental and skeletal measurements and reported that the mandibular canines was the tooth likely to survive both dental disease and air

crashes.⁵ Hence, canine exhibits the greatest sexual dimorphism among all teeth.⁶ Sexual dimorphism refers to those differences in size, stature, and appearance between male and female that can be applied to dental identification as no two mouths are alike.⁷

Mandibular canines are found to exhibit the greatest sexual dimorphism among all teeth because of the following reasons:

- Canines are less exposed to plaque and calculus, so less severely affected by periodontal disease
- Lesser pathological migration of mandibular canines than other teeth
- Canines are the last teeth to be extracted with respect to age
- Canines are more likely to survive in conditions such as air disasters, hurricanes, or conflagration.^{6,8,9.}

The present study aimed to evaluate and compare the sexual dimorphism from canine teeth indices in students.

Materials and Methods

The present study was conducted on 100 students (50 Male, 50 Female) who were selected based on following inclusion criteria:

- Age – 18-24 years
- Normal Molar & canine relationship
- Fully erupted teeth
- Caries free teeth.
- Absence of spacing in the anterior teeth.
- No fillings or extractions.
- No crowns or orthodontic apparatuses

Materials

- Sliding Venire Caliper used for measurement of mesiodistal crown width of canine tooth.
- Divider used for measurement of canine arch width.

Method

All the following measurements were done by a single examiner to eliminate interobserver error. The data were subjected to statistical analysis using t test.

Studied Parameters

- Mesiodistal crown width was recorded in millimeter as mesiodistal crown width of individual canine tooth.
- Intercanine Distance was measured by keeping tip of one end of divider over the centre of the tip of one side canine tooth and another end of divider over the centre of tip of opposite side canine tooth.

Calculated Formulas

- Canine Index: Mesiodistal crown width of Mandibular canine x 100 canine arch width
- Sexual Dimorphism: $(X_m / X_f) - 1 \times 100$

Where: X_m = Mean tooth dimension value for males

X_f = Mean tooth dimension value for females

Statistical Analysis

The mean values with standard deviation were calculated for all the parameters and comparison between the two groups was made by using t-test. The difference between the two groups was said to be statistically significant if P value is < 0.0001.

Gender	No. of Subjects	Right		Left	
		Mean	SD	Mean	SD
Male	50	6.93	0.58	6.51	0.61
Female	50	6.29	0.41	6.23	0.42

Measurement	Male		Female	
	Mean	SD	Mean	SD
Intercanine distance	30.15	1.96	28.59	1.55

Results and Discussion

Males showed greater mean mesiodistal dimensions for each tooth in comparison to females in mandibular arches. The mean values of mandibular canine widths in males and females on the right and left sides were compared using t-test and were found to be statistically significant ($P < 0.0001$). The mean value was greater in males as compared to females. The level of accuracy for sex determination using mandibular canine index found 71% females and 81% males were classified correctly.

In forensics, gender determination in damaged and mutilated dead bodies or from skeletal remains constitutes the primary step. It can also be used for identification in medico-legal examination and bioarcheology.¹⁰ Various factors that have been found to have some bearing on tooth size giving rise to morphometric differences between male and female teeth.^{11,12,13} Garn et al had correlated sexual dimorphism in canines with number of variables, namely stature, weight, subcutaneous fat thickness, bone age, menarche in girls and the time of epiphyseal union. These correlations suggested direct influence of steroidal hormones on tooth development and maturation. They found that tooth eruption is accelerated in early maturing girls; indicating that to some extent steroid hormones of gonadal and adrenal origin may be involved in the relationship between sexual maturation and dental development.¹⁴ The present study establishes the existence of a definite statistically significant sexual dimorphism in mandibular canines. This finding is consistent with that of work done by other authors.^{15,16} It establishes the inter-canine distance and mandibular canine index as useful parameters in differentiating the sexes. Garn et al, studied the magnitude of sexual dimorphism by measuring the mesiodistal width of the canine teeth and showed that “the mandibular canine showed a greater degree of sexual dimorphism than the

maxillary canine.”¹⁷ However, Minzuno reported that maxillary canine showed a higher degree of sexual dimorphism compared to the mandibular canine in a Japanese population.¹⁸ The present study comprised of 100 subjects, of which 50 were males and 50 were females. We were able to successfully predict sex to an extent as high as 71% females and 81% males.

Conclusion

Mandibular Canine Index is an easy method for determining sex in forensic identification.

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