

Original Research

Mandibular canine index: a clue for gender determination in North-East population living in Paonta Sahib (Himachal Pradesh)

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ABSTRACT:

Introduction: In forensic studies different methods are utilized for gender determination. Generally canine tooth is utilized for gender determination because they are the most stable teeth, they bear greatest amount of sexual dimorphism and are also resistant to disease and post mortem insults. **Aim:** Gender determination using mandibular canine index in north-east population living in Paonta Sahib (Himachal Pradesh) and to assess its reliability. **Material and methods:** The study population comprised 100 subjects that are 50 males and 50 females with an age range of 18–30 years. Measurements were made in millimetres at the contact point of mesiodistal width of the right and left canines and intercanine distance intraorally. The mandibular canine index (MCI) was calculated. **Results:** There was a significant difference observed between right and left canine width, right mandibular canine index and intercanine distance between males and females. The overall accuracy for gender determination in our study was found to be 65.7%. **Statistical Analysis Used:** Independent sample t-test was used. $P < 0.05$ was considered statistically significant. **Conclusion:** It is evident from our study that the mandibular canine index is a valuable tool for gender determination.

Key words: Gender Determination, Mandibular Canine, Forensic Sciences, Canine Index.

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INTRODUCTION:

Teeth are a recognised material in living and non-living populations for forensic, genetic, odontology and anthropological examinations. Being the hardest and with chemicals, the principal stable tissues inside the body they're specifically secured and fossilized, by this means the can be by far the best evidence for evolutionary change.¹ Mandibular canines exhibit the greatest sexual dimorphism among all teeth.^{2,3}

The mandibular canines have a mean age of eruption of 10.87 years and are less influenced than other teeth by periodontal diseases.⁴ These are the last teeth to be extracted concerning age. Canines are likewise better prone to endure extreme injury, for example air disasters, hurricanes or conflagration. These results demonstrate that mandibular canines can be considered as the 'key teeth' for individual

identification.⁵ The present investigation is a genuine endeavour to determine gender using mandibular canine index in north-east population living in Paonta Sahib (Himachal Pradesh) and to assess its reliability.

MATERIALS AND METHODOLOGY:

INCLUSION CRITERIA⁶

1. Healthy state of gingiva and periodontium
2. Caries free canine teeth
3. Normal overjet and overbite (2-3 mm)
4. Absence of spacing in the anterior teeth
5. Class I molar and canine relationship

After selecting the subjects randomly and explaining aims of the study to them, written informed consent was obtained in the prescribed form. Measurements

were taken intra orally on either side of the jaw using a digital caliper with a resolution of 0.01 mm with the provision to fix it in the desired position so as to avoid any errors in recording the exact measurements of canines and a divider with pointed tips. The following measurements were taken in the subjects with the oral cavity wide open.

Using a divider, the greatest mesio-distal width of a canine tooth at a contact point with the adjacent teeth was taken and the value was measured by placing the two pointed ends of the divider in between jaws of the digital caliper and measurements were noted.

Inter-canine distance: The inter-canine distance was measured using a digital caliper by placing the two pointed ends of its jaws over the canine tip and values were noted (direct method). The inter-canine distance was also measured using coloured drawing sheets (indirect method). The subject was asked to open his/her mouth wide. The coloured drawing sheet was placed between the acrylic sheet and black carbon paper and positioned in the oral cavity. Then the subject was asked to bite these sheets firmly and the impressions of the incisal surfaces of the teeth were obtained on the drawing sheet. Using the digital

caliper, the inter canine distance markings on the drawing sheet, corresponding to the canine teeth were measured, and values noted. Yellow and pink coloured drawing sheets were used to take the impressions of the maxillary and mandibular teeth respectively. In case of nonpointed impression of the canine, the midpoint of the impression was considered for inter-canine distance. Readings obtained were subjected for analysis to derive conclusions. Further the canine index and standard canine index were calculated for all the four canines using the formula cited by Muller M et al.⁷

Data obtained were quantified and analysed statistically using SPSS (Statistical Package for the Social Sciences, Version 11.5) Independent sample t-test was used. P < 0.05 was considered statistically significant.

Gender was predicted based on the observed canine index and standard canine index. If the observed canine index was more than the standard canine index, then the individual was considered to be male and if the observed canine index was less than the standard canine index, then the individual was considered to be female.

RESULTS

CANINE	GENDER	MEAN(mm)
RIGHT	MALE	7.02
	FEMALE	6.43
LEFT	MALE	7.03
	FEMALE	6.51

GENDER	MEAN
MALES	26.64
FEMALES	25.42

$$\text{CANINE INDEX} = \frac{\text{MESIO DISTAL CROWN WIDTH OF CANINE}}{\text{INTERCANINE DISTANCE}}$$

GENDER	TOOTH	MEAN
MALE	RIGHT	0.263
	LEFT	0.264
FEMALE	RIGHT	0.251
	LEFT	0.2476

$$\text{STANDARD CANINE INDEX} = \frac{(\text{MEAN MALE CI} - \text{SD}) + (\text{MEAN FEMALE CI} + \text{SD})}{2}$$

RIGHT CANINE	0.258
LEFT CANINE	0.25

STANDARD CANINE INDEX > FEMALE CANINE INDEX
 STANDARD CANINE INDEX < MALE CANINE INDEX



Table 5: GENDER PREDICTIBILITY USING MANDIBULAR CANINE INDEX		
CANINE INDEX (CI)	GENDER	CASES
RIGHT CI	MALES	30(50)
	FEMALES	25(50)
LEFT CI	MALES	39(50)
	FEMALES	32(50)

MEASUREMENT OF MESIO-DISTAL WIDTH OF CANINE



MEASUREMENT OF INTER-CANINE DISTANCE

DIRECT METHOD



INDIRECT METHOD



DISCUSSION:

Teeth are an excellent material in living and non-living populations for anthropological, genetic, odontologic and forensic investigations. Considering the fact that there are differences in odontometric features in specific populations, even within the same population in the historical and evolutionary context, it is necessary to determine specific population values in

order to make identification possible on the basis of dental measurements.⁸

Kaushal S et al⁴, Bakkannavar SM et al⁹ and Mughal IA¹⁰ et al conducted studies on mandibular and maxillary canine indices and sexual dimorphism. They found that mandibular canine index was more appropriate than maxillary canine index, and mandibular canine is more sexually dimorphic. So our study was conducted on mandibular canine index for

gender determination in north-east population living in Paonta Sahib (Himachal Pradesh) and to assess its reliability.

In our study left canine width, right canine width, left canine index and inter canine distance in males were significantly higher than females which were in accordance with the studies done by Kaushal S et al⁴, Bakkannavar SM et al⁹ and Mughal IA.¹⁰

There was no significant difference between Males & Females for RIGHT CANINE INDEX ($p>0.05$.) which was in accordance to studies done by Patil SN et al.⁸

Left mandibular canine was found to be more dimorphic than right mandibular canine which is in accordance with the study done by Reddy VM et al⁶

The overall accuracy for gender determination in our study was found to be 63%. Similar Gender prediction has been reported for North Indians (75%), South Indians (82.27%), Punjabi–Pakistani population (76%) and French population (59.57%).⁴

CONCLUSION:

Although DNA profile gives more accurate results yet measurement of linear dimensions, such as inter canine distance and mesiodistal width of canine teeth can be used for gender determination because it is simple, reliable, inexpensive, and easy to perform. When used with other parameters, it increases the percentage accuracy of gender determination.

LIMITATIONS:

The measurements of current study were done by single observer, therefore the inter observer variability could not be determined.

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