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THE MORPHOMETRIC STUDY OF PERMANENT MANDIBULAR CANINES FOR GENDER ESTIMATION IN RAJASTHAN POPULATION

Anatomy

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ABSTRACT

Dentition is useful in gender and age estimation since teeth are resistant to post-mortem destruction, fragmentation and first-rate material for genetic and forensic investigations. Sexual Dimorphism means differences in size, stature and appearance between male and female, which can be applied for dental identification. The present study was performed on 80 patients from NIMS dental college and hospital, Jaipur. Mesiodistal width and intercanine distance were measured on the basis of intraoral examination and plaster modal with the help of Vernier calliper. Mandibular canine Index and sexual dimorphism (in percentage) were calculated from these measured parameters. Mesiodistal width of left mandibular canine shows maximum sexual dimorphism among all measurements. This study signifies the possible role of morphometric study of canine teeth in estimation of gender and it can be used in forensic investigations where gender determination of skeletal remains is difficult.

KEYWORDS

canines, canine index, sexual dimorphism

INTRODUCTION

The dentition is considered as an useful adjunct in skeletal gender estimation, particularly since teeth are resistant to postmortem destruction and fragmentation. Teeth are the first-rate material for genetic and forensic investigations[1].

Determination of gender is important in forensic investigations. Although DNA analysis is the most precise technique to determine the gender, but sometimes lack of facilities and the cost factor may be a hindrance. In such cases the teeth especially the canines form an important material as they are hardest and chemically most stable tissues[2].

"Sexual Dimorphism" refers to those differences in size, stature and appearance between male and female that can be applied to dental identification because dentitions of two persons are different. Gender determination of skeletal remains a part of many medico-legal as well as anthropological examinations. Many anatomical structures have been studied, but the teeth and their measurements seem to be the most reliable method since teeth represent the most durable and resilient part of the skeleton[3].

Sexual dimorphism in canines can be determined by using linear dimensions like the buccolingual, mesiodistal and the intercanine diameters[4].

The canines are less affected by periodontal diseases than other teeth. With respect to age, these are the last teeth to be extracted. Canines are also more likely to survive severe trauma such as air disaster, hurricanes or conflagration. These findings indicate that canines can be considered as the "key teeth" for personal identification[5].

MATERIALS AND METHODS

The present study was conducted in NIMS Medical College, Department of anatomy Jaipur, Rajasthan. Total number of subjects was 80. All the measurement were be repeated for both right & left sides in mandibular jaws with the help of vernier caliper .The measurements of these parameters were established on the basis of intraoral examination and plaster modal. The following parameters were observed:

1. Mesiodistal crown width of canines
2. Intercanine distance (canine arch width)

By using the above measurements, the Mandibular Canine Index (MCI) was calculated as-

$$MCI = \frac{\text{Mesiodistal width of canine}}{\text{Intercanine distance}}$$

The mean values of mesiodistal width, intercanine distance and canine index of males and females were calculated. The data obtained were subjected to statistical analysis with the Microsoft Excel, using descriptive statistics. The unpaired t-test was applied to compare the dimensions measured for males and females. $P \leq 0.01$ was considered statistically significant.

The mean values of mesiodistal width, intercanine distance and canine index of males and females were subjected to the formula to calculate the sexual dimorphism (in percentage).

Sexual dimorphism (in percentage) = Xm / Xf -1 x 100
Xm =mean value of males Xf=mean value of females

Inclusion criteria:

a) Fully erupted, fully formed root and periodontally healthy canine
b) Non-carious, non-attrited, intact teeth.
c) No history of orthodontic treatment.
d) No evidence of cleft palate
e) Absence of restorations and endodontic filling.
f) Adults (18-60 years)

Exclusion criteria:

a) Teeth abnormalities (like rotation, crowding, occlusal disharmony),
b) Physiologic or pathologic wear and tear (like attrition, abrasion, erosion)
c) Deleterious oral habits like bruxism, bad oral hygiene and Pregnant female

Instruments:

Following Instruments were used in the present study: -

1. Vernier calliper
2. Standardized flexible measuring ribbon tape
3. Dental cast

RESULTS

Table & Graph No 1: Mean ± SD of Right canine width of intraoral & cast according to sex

Parameters	Mean ± SD		P-value	Significance
	Male	Female		
Intra-oral	7.2305±0.1754	6.601±0.1178	0.0001	Extremely Significant
Cast	7.239±0.1814	6.603±0.1194	0.0001	Extremely Significant

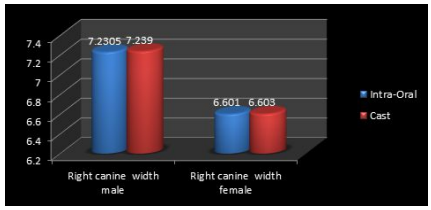


Table & Graph No 2: Mean ± SD of Left canine width of intra oral & cast according to sex

Parameters	Mean ± SD		P-value	Significance
	Male	Female		
Intra-oral	7.227±0.1401	6.571±0.0865	0.0001	Extremely Significant
Cast	7.227±0.1280	6.58075±0.0907	0.0001	Extremely Significant

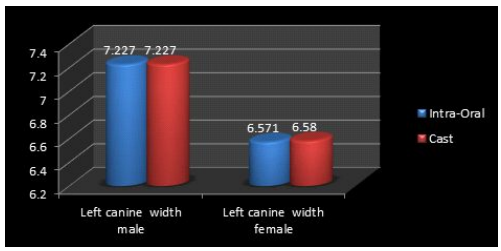


Table & Graph No3: Mean ± SD of intercanine distance of intraoral & cast according to sex.

Parameters	Mean ± SD		P-value	Significance
	Male	Female		
Intra-oral	25.483±1.00	23.786±0.6544	0.0001	Extremely Significant
Cast	25.527±0.97	23.848±0.6339	0.0001	Extremely Significant

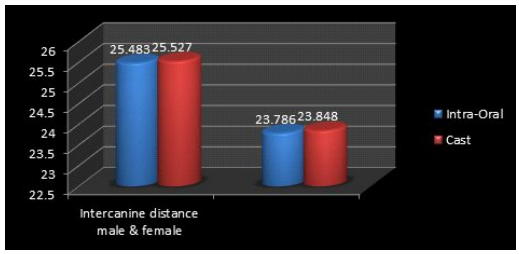


Table & Graph No 4: Mean ± SD of Right canine index of intraoral & cast according to sex

Parameters	Mean ± SD		P-value	Significance
	Male	Female		
Intra-oral	0.2843±0.014	0.2777±0.009	0.0142	Significant
Cast	0.28405±0.0143	0.2770±0.008	0.0085	significant

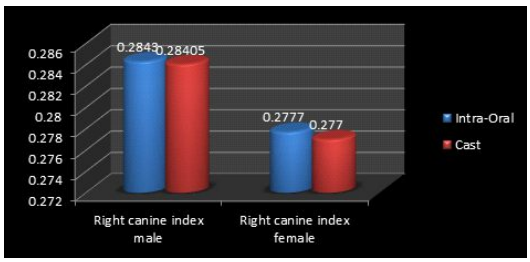


Table & Graph No 5: Mean ± SD of Left canine index of intraoral & cast according to sex

Parameters	Mean ± SD		P-value	Significance
	Male	Female		
Intra-oral	0.2840±0.0136	0.2764±0.0085	0.0037	Significant
Cast	0.2834±0.0126	0.2761±0.0085	0.0032	Significant

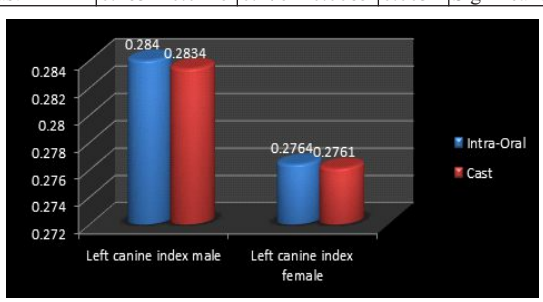
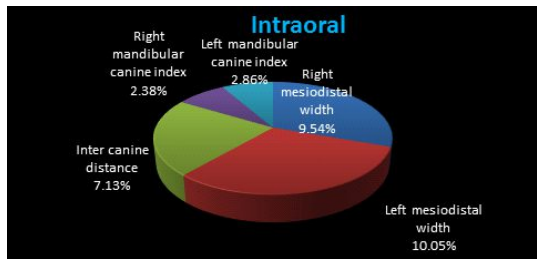
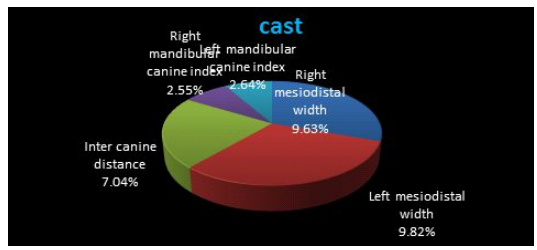


Table & Graph No 6: Sexual dimorphism (in percentage) in mandibular canine tooth

Parameters	Intraoral(%)	Cast(%)
Right mesiodistal width	9.54	9.63
Left mesiodistal width	10.05	9.82
Inter canine distance	7.13	7.04
Right mandibular canine index	2.38	2.55
Left mandibular canine index	2.86	2.64





When comparison right canine width intraoral & cast between male & female, right canine width intraoral (7.230± 0.17), cast (7.239±0.18) in male and intraoral (6.601± 0.12), cast (6.603 ± 0.12) in female. P-value < .0001 so there was extremely significance as shown in Table & graph 1.

When comparison left canine width intraoral & cast between male & female, left canine width intraoral (7.227± 0.14), cast (7.227±0.13) in male and intraoral (6.571± 0.09), cast (6.580 ± 0.09) in female. P-value < .0001 so there was extremely significance as shown in Table & graph 2.

When comparison intercanine distance intraoral & cast between male & female, intercanine distance intraoral (25.483± 1.00), cast (25.527± 0.97) in male and intraoral (23.786± 0.65), cast (23.848 ± 0.63) in female. P-value < .0001 so there was extremely significance as shown in Table & graph 3.

When comparison right canine index intraoral & cast between male & female, right canine index intraoral (0.284± 0.01), cast (0.284±0.01) in male and intraoral (0.278± 0.01), cast (0.277 ± 0.01) in female. P-value < .01 so there was significance as shown in Table & graph 4.

When comparison left canine index intraoral & cast between male & female, left canine index intraoral (0.284± 0.01), cast (0.283±0.01) in male and intraoral (0.276± 0.01), cast (0.276 ± 0.01) in female. P-value < .01 so there was significance as shown in Table & graph 5.

The sexual dimorphism was slightly greater on the left side than the right side. Mesiodistal width of left mandibular canine teeth shows maximum sexual dimorphism among all measurements(introral 10.05%, cast 9.82%).

DISCUSSION

Hashim and Murshid conducted a study on pretreatment orthodontic casts of 720 Saudi male and female subjects in the age group of 13 to 20 years and found that the mandibular canines were only teeth to exhibit sexual dimorphism[6]. Hence the present study was conducted on mandibular canines to find out the sexual dimorphism.

Kaushal et al conducted a study on 60 north indian subjects and found the left mandibular canine (intraoral 8.89% and cast 9.796%) to be more dimorphic than the right mandibular canine (intraoral 7.954% and cast 7.96%)[7]. Similarly, Nair et al concluded that the left mandibular canine shows maximum sexual dimorphism (7.7%) followed by right mandibular canine (6.2%)[8]. Our study also gave a similar result. In the present study, the left mandibular canine (intraoral

10.05% and cast 9.82%) was also found to be more dimorphic than right mandibular canine(Intraoral 9.54% and cast 9.63%)

In the studies of Garn *et al.* and Anderson and Thompson the sexual dimorphism was slightly greater on the right side than the left side[9]. However, in the present study, the left mandibular canine (intraoral 10.05% and cast 9.82%) was found to be more dimorphic than right mandibular canine(Intraoral 9.54% and cast 9.63%)

CONCLUSION

After a detailed study and comparison of our work with previous studies, we concluded that mandibular canine index and sexual dimorphism can determined the gender of mandibular canine as the relevant values are always greater in males comparison to females The widths of the mandibular right and left canine teeth were almost bilaterally symmetrical in females and males. The mean value for right and left mandibular canine width were less for females than for males and the differences were statistically significant. The mean value for mandibular intercanine distances for females were less than for males and the differences were statistically significant. The mean value for right and left mandibular canine index were less for females than for males and the differences were statistically significant. The sexual dimorphism was slightly greater on the left side than the right side. Mesiodistal width of left mandibular canine teeth shows maximum sexual dimorphism among all measurements. The mandibular intercanine distance was found to show significant sexual dimorphism. This study signifies the possible role of morphometric study of canine teeth in estimation of gender and it can be used in forensic investigations where gender determination of skeletal remains is difficult.

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