

## Odontometric study of canines in Indian population for sex determination

R K Gorea and Maneesha Sharma\*

**Abstract:** Identification of living persons and the dead bodies is of great importance in the practice of forensic medicine. Establishing sex is one of the main factors employed to know the identity. Teeth form an exceptional material in living as well as nonliving for odontologic and forensic investigations; being available even in mutilated and decomposed bodies as they are chemically very stable tissue in the body. The present study was conducted on 201 cases of Indian population at random to study the effectiveness of Inter canine distance in predicting the sex. It is observed that inter canine distance in both the jaws is greater in males as compared to females in the age groups above 17 years of age.

**Keywords:** Inter canine distance, mandibular/maxillary canine, sex determination from teeth.

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### INTRODUCTION

Determination of sex is of utmost importance in forensic investigations. Although DNA analysis is the reliable way to determine the sex, 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. Their availability in mutilated and decomposed bodies makes them invaluable for identification. If there are intact jaws, inter canine distance can help in determination of sex.

Anthropometric measurements of the skeleton and the comparison with existing standard data may help to differentiate between male and female remains. While determining the sex of an individual one criterion may not be characteristic. When we consider many criteria together, they are usually helpful in most of the cases<sup>1</sup>. Based on odontometric studies, tooth size standards can be employed in sex and age determination<sup>2</sup>. Once the sex has been predicted, identification becomes easier, because then we need to consider the missing persons of only one sex.<sup>3</sup>

Canines are resistant to plaque formation, calculus and abrasion from brushing and less severely affected by periodontal disease, so commonly the last teeth to

be extracted with respect to age.<sup>4</sup>

In a study conducted on mandibular canines of north Indian population it was observed that there is a significant difference in inter canine distance in males and females.<sup>5</sup> Mohammed et al (1997) concluded that mean maxillary inter canine distance was less in females than males and the difference was significant.

### MATERIAL AND METHOD

The present study was conducted on 201 dental casts obtained from consenting volunteers at random in the department of Forensic Medicine, Govt. Medical College, Patiala and the study was completed in the department of Forensic Medicine at Gian Sagar Medical College, District Patiala.

Maxillary and Mandibular impressions of all the samples were made with alginate and study models prepared in dental stone. Inter canine distance of both jaws were studied. Measurements were taken for all the subjects using digital vernier calipers with resolution of 0.02mm.

Inter canine distance was measured as distance between the cusp tips of right and left canines. In case cusp tip was absent, then minimum and maximum inter canine distance between the two canines was taken and the average of these two indicated the inter canine distance.

### RESULTS

Following tables are showing various results obtained in the present study. The results have been depicted in table 1, 2 and 3.

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**Table -1**  
**Inter canine Distance in all cases**

SR NO	Age	Sex	Maxillary canines			Mandibular canines		
			No. of cases	mean(mm)	SD	No. of cases	mean(mm)	SD
1	1-6	M	2	28.64	0.7	2	22.17	2.06
		F	1	24.74	0	1	24.17	0
2	6-17	M	6	32.92	1.45	5	24.74	0.49
		F	8	34.02	2.88	6	25.54	1.58
3	17-30	M	65	34.7	2.44	65	25.56	1.72
		F	69	33.09	2.08	70	24.95	2.11
4	30-50	M	33	34.52	2.69	32	26.21	2.04
		F	7	32.2	1.38	8	25.01	0.98
5	50-60	M	5	32.55	2.61	5	23.64	1.22
		F	nil	0	0	0	0	0
Total			196			194		

**Table - 2**  
**Inter canine distance (where cusp tip was present)**

SR NO	Age	Sex	Maxillary canines			Mandibular canines		
			No. of cases	mean(mm)	SD	No. of cases	mean(mm)	SD
1	1-6	M	0	0	0	1	20.71	0
		F	1	24.74	0	0	0	0
2	6-17	M	5	32.95	1.28	2	24.85	0.77
		F	7	34.67	2.38	6	25.54	1.58
3	17-30	M	44	35.54	2.16	44	25.67	1.81
		F	39	33.68	2.14	44	25	2.26
4	30-50	M	12	36.97	2.02	10	25.95	2.75
		F	2	32.11	1.37	2	27.25	3.69
5	50-60	M	0	0	0	0	0	0
		F	0	0	0	0	0	0
Total			110			109		

#### SD-STANDARD DEVIATION

The readings obtained were subjected to statistical analysis using Microsoft excel spreadsheets to assess the degree of importance of inter canine distance in establishing the sex of an individual. In 5 cases, in maxillary canines, there was overriding of incisors and in 7 cases, in mandibular canines there were either three incisors or overriding of incisors. So these cases were discarded while calculating inter canine distance to avoid any discrepancy.

From table-1, it is clear that inter canine distance in both the jaws is greater in males in age group 17-50 years. No case of female was there in age group 50-60 years. In 6-17 years, females have greater inter canine distance than males. But the number of cases in younger age groups below 17 years was less, so it needs further research before we can draw any conclusion.

In table-2, further sub grouping was done showing inter canine distance in the cases where cusp tip was present. The number of cases in this group was 110 in



Table - 3  
Inter canine distance (where cusp tip was absent)

SR NO	Age	Sex	Maxillary canines			Mandibular canines		
			No. of cases	mean(mm)	SD	No. of cases	mean(mm)	SD
1	1-6	M	2	28.64	0.7	1	23.62	0
		F	0	0	0	1	24.17	0
2	6-17	M	1	30.76	0	3	24.67	0.4
		F	1	29.45	0	0	0	0
3	17-30	M	21	32.54	2.46	21	24.9	2.41
		F	30	32.31	1.73	26	24.85	1.86
4	30-50	M	21	32.75	2.32	22	26.14	2
		F	5	32.23	1.53	6	29.08	1.06
5	50-60	M	5	32.55	2.61	5	22.83	2.1
		F	0	0	0	0	0	0
Total			86			85		

maxillary canines and 109 in mandibular canines. The results correspond to the ones derived from table-1.

In table 3, the intercanine distance in the cases where cusp tip was absent, has been depicted. Number of cases was 86 in maxillary canines and 85 in mandibular canines. In 17-50 years, the intercanine distance was greater than females. In the age groups 50-60 years all males had canines without tip. Because of fewer cases no conclusion could be drawn in age groups below 17 years.

From these findings, it can be said that there exists a definite sexual difference in the intercanine distance of both the jaws in age group 17-50 years.

#### DISCUSSION

The present study establishes the existence of a definite statistically significant difference in intercanine distance of canines of both the jaws, consistent with Hashim and Murshid(1993)<sup>7</sup>, who conducted a study on Saudi males and females in the age group 13-20 years and found that only the canines in both the jaws exhibited a significant sexual difference while the other teeth did not.

Gabriel (1958)<sup>8</sup> has stressed that any measurement of teeth unaccompanied by age, race and sex must be treated with great reserve. The present study depicts that the intercanine distance being greater in males than

female in age groups above 17 years while it is the reverse in age group below 17 years, but because of lesser number of cases in ages below 17 years nothing can be concluded.

Kaushal et al in 2003<sup>5</sup> conducted a study on mandibular canines of north Indian population in 60 cases (30 males and 30 females) in the age group 17-21 years. The mean mandibular intercanine distance was observed to be 25.928mm±1.186 in males and 25.003mm±1.150 in females, whereas in the present study it was 25.56mm±1.72 in males and 24.95mm±2.11 in females in the age group 17-30 yrs. Both the studies correspond closely in the results obtained. The mean mandibular intercanine distance was found to be 25.8mm in males and 24.8mm in females of age group 20-60 years in a study by Rai et al (2007).<sup>9</sup>

Mohammed et al (1997)<sup>6</sup> concluded that mean maxillary intercanine distance was less in females than males and the difference was significant. Craig (2007)<sup>10</sup> observed that the mean intercanine distance in maxillary teeth was 33.47mm±2.43 in males and 32.25mm±2.56 in females. In the present study, it was found to be 34.7mm±2.44 in males and 33.09mm±2.08 in females.

The intercanine distance in cases where cusp tip was absent was also found to be greater in males than female in both the jaws, but the difference was less.

## CONCLUSION

From the present study it can be concluded that the intercanine distance in males is greater than females in both the jaws in age groups 17-50 years. The present study can help even in those cases where the cusp tip is absent. Most of the previous studies have excluded such cases. The present study results indicate that the intercanine distance of both mandibular and maxillary canines can be of great medicolegal use in identification. The study defines morphometric criteria for intercanine distance in Indian population. Further research in age groups below 17 and above 50 yrs should be done to draw some conclusion.

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