

Establishment of sexual dimorphism of permanent maxillary canine teeth in Rajasthan population by orthopantomographic study

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Abstract

Background: Teeth and their measurements give the impression to be the most reliable method since teeth prove the most durable and resilient part of the skeleton. Especially Canines are the most durable teeth in the oral cavity due to the labio-lingual thickness of the crown and the root anchorage in the alveolar process of the jaws.

Objective: Establish the sexual dimorphism of permanent maxillary canine teeth in Rajasthan population by Orthopantomographic study

Methodology: 300 patients of 150 male and 150 females was included in the study. Use Measurement like mesiodistal width and intercanine distance in maxillary jaws were established based on radiographic examination with the help of digital Orthopantomograph.

Results: Canine mesiodistal width was higher in male (left: 7.80 ± 0.04 and right: 7.80 ± 0.04) then female (left: 7.54 ± 0.15 and right: 7.53 ± 0.12) p-value = <0.001 . Maxillary intercanine distance was 36.45 ± 0.81 for male & 34.76 ± 1.55 for female. On the other hand, maxillary right and left canine index was higher in female than male P-value <0.001 .

Conclusion: Maxillary intercanine distance shows maximum sexual dimorphism among all measurements and canine index shows negative sexual dimorphism.

Keywords: Canine, intercanine, orthopantomograph, teeth

Introduction

The study of teeth is of great importance in living and non-living population to anthropologists, biologists, forensic scientists and orthodontists. These exhibit the least turnover of natural structure and are easily manageable for investigation. Different features of teeth, including their detailed morphology, crown size, root lengths etc. tend to vary between males and females. These variations can help a forensic scientist to identify the gender of the victims of mass disasters since the teeth are generally preserved even when the soft tissue and bones have been destroyed ^[1, 2].

Sexual dimorphism denotes to those dissimilarities in size, structure and appearance between

male and female at the same age, which can be applied to dental identification because no two oral cavities are same [3, 4].

In many pieces of research on the contemporary human population, it has been proved that tooth crowns are larger in males than in females in possibly due to an elongated period of amelogenesis for both deciduous as well as permanent teeth in males. It has also been proposed that there is slow maturation in males because of Y chromosome [5, 6].

Gender determination of skeletal remains is a part of many medicolegal as well as anthropological examinations. Although various anatomical structures have been observed, the teeth and their measurements appear to be the most reliable method since teeth prove the most durable and resilient part of the skeleton [7].

Canines are perhaps the most durable teeth in the oral cavity due to the labio-lingual thickness of the crown and the root anchorage in the alveolar process of the jaws. The shape of the crown portions of the canines is in such a manner that promotes cleanliness. The processes of self-cleaning and efficient anchorage in the jaws help to preserve these teeth throughout life. Canines are the last teeth to be extracted along with the age since they are least affected with grinding from brushing, endure lesser occlusal loading and are less badly affected by periodontal disease. Canine teeth are more resilient to persist serious trauma such as air disasters, conflagration and hurricanes. These outcomes prove that canines can be considered the 'key teeth' for individual identification [8, 9, 10, 11].

Objective

Establish the sexual dimorphism of permanent maxillary canine teeth in Rajasthan population by Orthopantomographic study.

Materials and Methods

300 patients comprised 150 Males and 150 Females reporting to the Department of Oral Medicine & Radiology, Dental College of National Institute of Medical Science & Research, University, Jaipur (Rajasthan).

Inclusion criteria

1. The subjects having a complete set of fully erupted, morphologically well-formed teeth.
2. Absence of spacing in the anterior teeth.
3. Normal molar and canine relationship.
4. No history of orthodontic treatment.
5. No evidence of cleft palate or crown restorations.

Exclusion criteria

1. Subjects with hard tissue abnormalities (like rotation, crowding, occlusal disharmony).
2. Physiologic or pathologic wear and tear (like attrition, abrasion, erosion).
3. Restored either in the crown or root or have prosthesis to it.

All the measurement for both right & left sides in maxillary jaws were established on the basis of radiographic examination with the help of digital Orthopantomograph. The following parameters were observed:

1. Mesiodistal width of canines.
2. Inter canine distance.

Mesiodistal width

Maximum width of maxillary canine is measured along the distal surface of canine to the mesial surface of canine.

Inter-canine distance

Maximum Inter canine distance is measured from tip of right canine to tip of left canine in maxillary Jaw.

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

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

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

Sexual dimorphism (in percentage) = $X_m/X_f - 1 \times 100$.

X_m = mean value of males X_f = mean value of females.

Results

Table 1: Mean \pm SD of maxillary canine mesiodistal width of orthopantomograph among male and female patients.

Parameters	Gender	Mean (mm)	\pm S.D.	'p' value	Significance
Right Maxillary canine MD width	Male	7.80	0.04	<0.0001	HS
	Female	7.53	0.12		
Left Maxillary canine MD width	Male	7.80	0.04	<0.0001	HS
	Female	7.54	0.15		

Table 2: Mean \pm SD of intercanine distance of orthopantomograph among male and female patients.

Parameters	Sex	Mean (mm)	\pm S.D.	't' state	'p' value	Significance
Maxillary intercanine distance	Male	36.45	0.81	11.83	<0.0001	HS
	Female	34.76	1.55			

Table 3: Mean \pm SD of the right maxillary canine index of orthopantomograph among male and female patients

Parameters	Gender	Mean (mm)	\pm S.D.	't' state	'p' value	Significance
Right Maxillary canine index	Male	0.214	0.0065	4.82	<0.0001	HS
	Female	0.217	0.0124			
Left Maxillary canine index	Male	0.214	0.0065	4.81	<0.0001	HS
	Female	0.217	0.0129			

Table 4: Sexual dimorphism (in percentage) in maxillary canine tooth

Parameters	OPG (%)
Right canine mesiodistal width	3.59
Left canine mesiodistal width	3.45
Maxillary Intercanine distance	4.86
Right maxillary canine index	-1.38
Left maxillary canine index	-1.38

Comparison of maxillary right and left canine mesiodistal width between male and female

indicates that values higher in males as compared to females and P-value <.0001, it was highly significant. Maxillary right canine mesiodistal width was 7.80 ± 0.04 for male & 7.53 ± 0.12 for female. Maxillary left canine mesiodistal width was 7.80 ± 0.04 for male & 7.54 ± 0.15 for female.

Comparison of maxillary intercanine distance between male and female indicates that values higher in males as compared to females and P-value <.0001, it was highly significant. Maxillary intercanine distance was 36.45 ± 0.81 for male & 34.76 ± 1.55 for female.

Comparison of maxillary right and left canine index between males & females indicates that values higher in females as compared to males and P-value <.0001, it was highly significant. Maxillary right canine index was 0.214 ± 0.0065 for male & 0.217 ± 0.0124 for female. Maxillary left canine index was 0.214 ± 0.0065 for male & 0.217 ± 0.0129 for female.

Discussion

In the present study, the mesiodistal width of maxillary canines was significantly larger in males compared to females. Similar results were obtained in the previous studies done by Kaushal *et al.* 2003^[10], Paramkusam *et al.* 2014^[12], Sharma *et al.* in 2014^[13], Syed *et al.* 2015^[14], Shastry *et al.* 2016^[5], Davoudmaneshl *et al.* 2017^[14]. The difference in width of canine between male and female teeth has been explained as part of the genetic expression of the male being larger than the female.

In the present study of maxillary canine, both the right and left canine index gave a negative percentage of sexual dimorphism. The result of the present study was in similar to the study conducted by Gupta *et al.* 2014^[16]. They also suggested that the sexual dimorphism in right and left canine index showed negative values -2.1% and -0.9% respectively. The result of the present study was in contrast with the study conducted by Shastry *et al.* 2016^[5]. They suggested that the maxillary left canine index (13.04%) showed a greater percentage of sexual dimorphism than right canine (8.34%).

In the present study of maxillary canine, the right canine mesiodistal width gave a better percentage of sexual dimorphism than the left canines. The percentages of sexual dimorphism were 3.59% for the right canine mesiodistal width and 3.45% for the left canine mesiodistal width. The result of the present study was similar with the study conducted by Syed *et al.* 2015^[14], Gupta *et al.* 2014^[16]. Syed suggested that the maxillary canines showed a higher percentage of sexual dimorphism on the right side than the left side. The percentage of sexual dimorphism for the maxillary canines on the right side was 8.23% (intraoral), 8.20% (cast) and on the left side was 8.23% (intraoral) 8.09% (cast). Gupta studied that the maxillary canines showed a higher percentage of sexual dimorphism on the right side 4.2% than the left side 3.6%.

Conclusion

After a detailed study and comparison of our work with previous studies, we concluded that the mesiodistal width of maxillary canine values always greater in males compared to females. The sexual dimorphism was slightly greater on the right side than the left side. The maxillary intercanine distance shows maximum sexual dimorphism among all measurements. The maxillary canine index shows negative sexual dimorphism.

Ethical approval

The study was cleared by the Institutional Ethical Committee, NIMS Medical College, NIMS University, Rajasthan, Jaipur. As well as study was performed under the Declaration of Helsinki revised version in 2013.

Informed consent: During the research process, informed consent was obtained from all the respondents.

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Conflicts of interest: There are no conflicts of interest.

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