Dr. Anil Sastya
Assistant Professor,
Department of Anatomy
Gwalior, Madhya Pradesh,
India

Dr. Raj Laxmi Sharma
Associate Professor,
Department of Anatomy
Gwalior, Madhya Pradesh,
India

Dr. Mussrat Jehan
Assistant Professor,
Department of Anatomy
Gwalior, Madhya Pradesh,
India

Dr. Preeti
Post Graduate Student,
Department of Anatomy
Gwalior, Madhya Pradesh,
India

Determination of gender by intercanine distance of maxilla

Dr. Anil Sastya, Dr. Raj Laxmi Sharma, Dr. Mussrat Jehan and Dr. Preeti

Abstract
Maxillary canine Teeth are the most useful objects in the field of forensic investigation. Teeth, specially the canines, are the chemically most stable and hardest tissues of the human body. Intercanine distance of maxillary teeth can provide identification of individual when mass disasters, trauma or fire has rendered the face unrecognisable. The present study establishes the impact of the canines in medicolegal identification.
Material and Method: 145 subjects, 92 males and 53 females in the age group of 18 –24 years were selected for this study. The study was conducted on the students of Gajra raja medical college Gwalior. All measurements were taken using a digital vernier caliper.
Results: The mean value of inter maxillary canine was greater in males as compared to females. Inter-canine distance was higher in males compared to females. The percentage of estimating the sex accurately is 79%.

Keywords: Maxillary canines, sexual dimorphism, forensic investigation

Introduction
In many animals, large maxillary canines are considered to be visual sexual signs of dominance and rank [19]. the carnivore gives rise to the term 'canine'. Maxillary canine Teeth are the most useful objects in the field of forensic investigation. Maxillary canine teeth has excellent and extraordinary resistant to putrifaction, postmortem destruction. Maxillary canines are the last teeth to be extracted with respect to age since they are least affected with abrasion from brushing, bear lesser occlusal loading and are less severely affected by periodontal disease. Variation in distance between them gives us clue about differences between the gender male or female [14]. Which makes them valuable elements for anthropological, genetic, odontologic, evolutionary and forensic investigations [9, 7]. Teeth, specially the canines, are the chemically most stable and hardest tissue of the human body. Identification of skeletal remains has great importance in the field of forensic medicine [7]. Teeth measurements are significantly authentic tool in determination of gender [9]. Rao *et al* in 1989 conducted a preliminary study in India that brought about a new advancement in the forensic anthropology [3].

Identification through Canine uncharacteristic features is the basis of individuality of a person. The question of personal identity arises in courts of law not only in the identification of criminals but also in the identification of other persons and dead bodies [6]. Intercanine distance of maxillary teeth can provide identification of individual when mass disasters, trauma or fire has rendered the face unrecognisable. The tooth, the most stable and hardest tissue in the body has been a useful adjunct in identification when other body parts cannot be used due to decomposition or mutilation. Maxillary canines, the most stable teeth bear the greatest degree of sexual dimorphism and play a highly valuable role in identification. The present study establishes the impact of the canines in medicolegal identification.

Aims and Objectives: The aim of present study was to assess sexual dimorphism of permanent inter maxillary canine distance, play a role in establishing gender identification. In case of unknown dead body inter-canine width play great role in establishing sex identity and reveals a lot concerning forensic medicine and also useful in human identification according to place.

Correspondence
Dr. Anil Sastya
Assistant Professor,
Department of Anatomy
Gwalior, Madhya Pradesh,
India

Material and Method

Selection Criteria: 145 subjects, 92 males and 53 females in the age group of 18 –
24 years were selected for this study. The study was conducted on the students of Gajra raja medical college Gwalior.

Inclusion Criteria: Subjects with the following status of teeth were included in the study:
1. Caries free teeth.
2. Total healthy Periodontium.
3. Complete Erupted teeth
4. Normal molar and canine relationship.
5. Absence of spacing in the anterior teeth.
6. No history or clinical evidence of trauma, restorations, orthodontic treatment or prosthesis.

The exclusion criteria employed for selection of the study sample were age 18 - 24 years, carries teeth, fractured teeth, malalignment, malrotation, malocclusion, spacing, missing incisor, dental restoration, dental wiring and prosthetics, mobile teeth and attrition. Persons suffering from chronic systemic diseases were excluded. After getting consent of the subjects, the following measurements were taken by using a sliding digital Vernier Caliper.

Instrument: The measurements of teeth were taken on an anatomically sound basis. All measurements were taken using a digital vernier caliper, taking into account the error if any, in the instrument. A divider with fixing device was also used for taking the measurements.

Measurement Procedure: The various parameters of the teeth were measured by using a sliding digital vernier calipers.

Inter-canine distance
1. The inter-canine distance was measured using a digital caliper by placing two points of caliper to the medial border of the two maxillary canine teeth. That is X_1
2. The inter-canine distance was measured using a digital caliper by placing two points of caliper to the lateral border of the two maxillary canine teeth. That is X_2
3. actual maxillary intercanine distance is = X

$$X = X_1 + X_2/2$$

Statistical analysis was performed using SPSS 16.0

Photo = intercanine distance of lateral side of maxillary canine

Photo = intercanine distance of medial side of maxillary canine.

Observations & result

Table 1: Statistical significance of mean Inter canine distance of maxilla from medial border of maxillary canine and lateral border of maxillary canine in males and females.

Sex	Medial border (m.m.)	Lateral border (m.m.)	Mean±SD (m.m.)	P value	Significance
Male (92)	28.50228	40.79957	34.6509±2.5073	<0.001	Highly significant
Female(53)	26.10434	37.6726	31.88849±2.5481		

Standard error = 0.43
t statistical = 6.42

The descriptive statistics and the degree of sexual dimorphism for maxillary inter-canine distance depicted in Table 1. The mean value of maxillary inter canine distance was greater in males compared to females. These study showed practically and significant difference between the sexes. Inter-canine distance was higher in males compared to females. The percentage of estimating the sex accurately was 79%. these study shows marked and significant difference in people belonging to different state and different country.

Discussion
The study was conducted to determine the sexual dimorphism that exists in the maxillary permanent canines.

This was done by measuring the medial and lateral intercanine distance. The study was conducted on 145 subjects, out of which 92 were males and 53 were females. The study established the existence of a definite statistically significant sexual dimorphism. Variation in intercanine distance of maxillary canine between the different populations being characteristic of genetic factor, environmental factors, sex, heredity, race, secular changes and bilateral asymmetry. Maxillary canine are the hardest and most stable (indestructible) structures of the body. These characteristics of canine teeth tend to preserve them throughout life; therefore, the canines are usually the last teeth to be lost [10]. These findings indicate that canines can be considered the 'key teeth' for personal identification [8].

Table 2: Comparison of maxillary intercanine distance in different populations

Population	Author	Inter Canine Distance (m.m.)	
		Male	Female
Nigeria	Zirahei [16]	37.80	35.34
Saudi Arabian	Al-Rifaiy [4]	34.76	26.46
Egyptian	Aliaa Omar [11]	36.823	34.653
Indian(Gujarat)	Dhara Parekh [13]	34.477	32.789
Indian(Gujarat)	N. Parekh [15]	30.62	28.62
Indian(Uttar Pradesh)	Gupta [12]	41.00	36.05
Indian(Maharashtra)	Baheti [18]	36.11	34.78
Present Study		34.65	31.88

Present study close to Dhara Parekh [13] (2012) who studied the people of Gujrat which is near state of Madhya Pradesh India. Similar observations were made by, Kumar *et al* (1989), who demonstrated that inter canine distance is useful in determination of gender. Aliaa Omar *et al* (2009) studied that maxillary Inter-canine distance showed statistically significant differences between both sexes [11]. Neelampari Parikh (2013) showed that the most sensitive indictors for gender determination were the maxillary inter-canine distance [15]. These study shows more than 79% cases accurately what is the sex of particular person or bone or if we include mandibular intercanine distance the percentage of accuracy will be more.

Conclusion
To conclude maxillary intercanine diameters of canines can be used as an aid for sex determination. Thereby, they can aid in identifying a person from fragmented jaws. The mean values for maxillary inter-canine widths were less for females than for males and the differences were statistically significant.

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