

## INTRA-ORAL MEASUREMENTS OF MANDIBULAR CANINES- A RELIABLE TOOL IN GENDER DETERMINATION

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### ABSTRACT

Teeth are the hardest and most stable among all tissues. Teeth are more resistant to destructive agents than any other structure and are well protected. The principal factors which make dental evidence important are that the teeth and bony supporting structures are characteristic of the individual. Dental identification is normally only necessary when a person's general features have been destroyed by time or circumstance. The dental tissues survive the effects of exposure to climate, water, fire, high impact and burial extremely well.

The canines are considered as the "key tooth" for the purpose of personal identification. In previous studies on canines, the odontometric measurements were made on dental casts. In the present study, intra-oral measurements on mandibular canines were made to determine the sexual dimorphism. The results indicate that intra-oral measurements of canines are a reliable tool for gender determination.

**Keywords:** intra-oral, mandibular, canines, gender determination.

### INTRODUCTION

During life, we are more likely to lose our teeth through wear, disease and decay. Yet after death, the teeth when present outlast the rest of the body. When all other marks of personal identity have been destroyed, the dentist is often able to recognize a body by the repair work he has done on the teeth.<sup>1</sup>

Forensic identification of a person living or dead is important not only medico legally but also in identification of victims of burns, explosion accidents, mass disasters, highly putrefied bodies, mutilated cadavers recovered in fragments.<sup>2,3</sup>

Dental identification is very important because the dental tissues survive the effects of exposure to climate, water, fire, high impact and burial extremely well.<sup>4</sup> In cases where postcranial bones are fragmented or unavailable, measurements of the mandibular canine tooth and inter-canine distance may provide a means of

determining sex.<sup>5</sup> Various studies have been conducted on dental casts to determine the sexual dimorphism in canines.<sup>6,7,8</sup>

In the present study, the intra-oral measurements of mandibular canines were used to determine the mandibular canine index and the sexual dimorphism. It was found that the intra-oral measurements of mandibular canines showed significant sexual dimorphism.

### MATERIAL AND METHODS

**Selection Criteria :** A total of 120 subjects, 60 males and 60 females in the age group of 17-21 years were selected for this study. This age group was selected as attrition is minimal in this age group.<sup>9</sup> The study was conducted on the students of Government Medical College, Patiala and National Dental College, Dera Bassi.

**Inclusion criteria :** Subjects with the following status of teeth were included in the study:

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

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### Instrument

The measurements of mandibular canines were taken on an anatomically sound basis. All measurements were taken using vernier calipers, taking into account the error if any, in the instrument. The calipers used had a resolution of 0.02 mm. A divider with a fixing device was also used for taking the measurements.

### Measurement procedure

This method was adopted from Kaushal et al.<sup>10</sup> The various parameters of the teeth were measured using dividers with a fixing device and Vernier caliper with a resolution of 0.02 mm.

1. A written informed consent was taken from the subjects and all aseptic precautions were taken while taking the intra-oral measurements.
2. The mesio-distal width of the right and left mandibular canines was measured as the greatest mesio-distal width between the contact points of teeth on either side of jaw (Fig 1 & 2).



Fig 1. Mesio-distal width of right canine

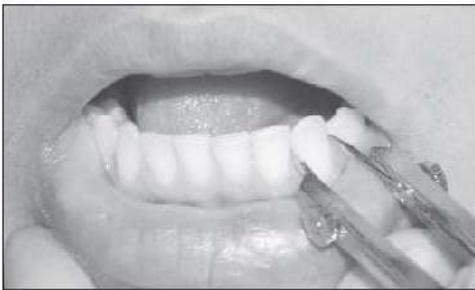


Fig 2. Mesio-distal width of left canine

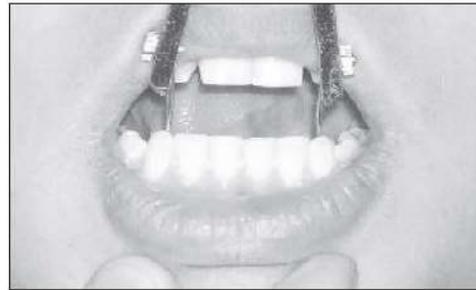


Fig 3- Inter-canine distance.

3. The inter-canine distance was measured between the tips of both canines in lower jaw (Fig 3).
4. Calculation of sexual dimorphism- Sexual dimorphism was calculated by the following formula:

$$\text{Sexual dimorphism} = \frac{Xm - 1 \times 100}{Xf}$$

Where Xm = Mean of mesio-distal width of males

Xf = Mean of mesio-distal width of females

5. Calculating the Mandibular canine index-

The mandibular canine index (MCI) was derived<sup>2</sup> as a ratio between two parameters of permanent mandibular canine teeth, namely the mesiodistal width and inter-canine distance (measured in mm) and it was calculated as follows:

$$\text{MCI} = \frac{\text{Mesio-distal width of mandibular canine}}{\text{Inter-canine distance}}$$

### OBSERVATIONS

In the present study, mesio-distal width (Table - 1) and inter-canine distance (Table - 2) were taken intra-orally to calculate the mandibular canine index (Table - 3) and the sexual dimorphism.

### Sexual Dimorphism

The sexual dimorphism was calculated to be 10.37% on the right side and 12.32% on the left side.

### DISCUSSION

In cases where postcranial bones are fragmented or unavailable, measurements of the mandibular canine

**Table 1**  
**Mesio-Distal Width of Mandibular Canines**

Side	Sex	Mean (mm)	±S.D.	't'stat	'p'value	Significance
Right	Males	7.268	0.378	8.46	Less than 0.0001	Extremely statistically significant
	Females	6.585	0.265			
Left	Males	7.416	0.320	11.48	Less than 0.0001	Extremely statistically significant
	Females	6.602	0.251			

The above results show that the mesio-distal widths of the right and left canines were larger in the males than the females and the difference was extremely statistically significant.

**Table 2**  
**Intercanine Distance of Mandibular Canines**

Sex	Mean (mm)	±S.D.	't'stat	'p'value	Significance
Males	26.138	0.534	4.79	Less than 0.0001	Extremely statistically significant
Females	24.865	1.43			

The above table shows that the inter-canine diameter of the canines was larger in the males than the females and the difference was extremely statistically significant.

**Table 3**  
**Mandibular Canine Index of Mandibular Canines**

Side	Sex	Mean (mm)	±S.D.	't'stat	'p'value	Significance
Right	Males	0.278	0.014	3.36	0.0013	Statistically significant
	Females	0.264	0.017			
Left	Males	0.283	0.0013	4.13	Less than 0.0001	Extremely statistically significant
	Females	0.266	0.019			

The above results show that the mandibular canine index of the right and left canines were larger in the males than the females and the difference was statistically significant.

tooth and inter-canine distance may provide a means of determining sex. Canines are less affected than other teeth by periodontal disease and are last teeth to be extracted with respect to age.<sup>5</sup> Mandibular canines exhibit the greatest sexual dimorphism amongst all teeth.<sup>11</sup> The sexual dimorphism was related to an absolutely longer period of amelogenesis for both deciduous and permanent dentitions in males than in females.<sup>12</sup>

Various tooth parameters of the mandibular canines help in gender determination. Sexual dimorphism in the canines has been studied in different parts of India and the world. Within India, a study on South Indian population<sup>13</sup> was conducted in 1999, on North Indian population<sup>14</sup> in 2004, on population of western Uttar Pradesh<sup>15</sup> in 2008 and on Central Indian population<sup>16</sup> in 2012. All the studies indicate that canine tooth size is significantly larger in the males.

Studies on the mesio-distal diameter of canines were conducted on the Saudi Arabian population<sup>6</sup>, on the Swedish population<sup>7</sup>, on Iraqi population<sup>8</sup>, on populations of USA<sup>17</sup>, in Chinese population<sup>18</sup> and recently in 2014 on Lebanese population.<sup>19</sup> In spite of the tooth size variability factors, the mesio-distal width of the mandibular canines was consistently more in the males than the females and the difference was statistically significant. The inter-canine distance was studied by various authors<sup>20, 21</sup> and they found that the parameter was significantly larger in the males.

Studies on tooth morphology in the past have been conducted using either intra-oral measurements or measurements on casts. Barrett<sup>23</sup> observed that intra-oral measurements are less reliable. In the present study, the intra-oral measurements of mesiodistal diameter and intercanine distance were larger in the males and the difference in the males and females was extremely

statistically significant. Thus, the results indicate that the intra-oral readings are as reliable as the readings taken on the casts.

The present study thus establishes the impact of the 'sex factor' on the morphometry of the mandibular canines. The results indicate that the dimorphism in mandibular canines by intra-oral measurements can be of immense medico-legal use in identification.

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