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ORIGINAL ARTICLE

Canine index – A tool for sex determination

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Abstract: Teeth are most useful tools in victim identification in the living as well as the dead in the field of forensic investigations. Their ability to survive in situations like mass disasters makes them constructive devices. Many authors have measured crowns of teeth in both males and females and found certain variations. Canines, reported to survive in air crash and hurricane disasters, are perhaps the most stable teeth in the oral cavity because of the labiolingual thickness of the crown and the root anchorage in the alveolar process of jaws. Measurement of mesiodistal width of the mandibular canines and inter-canine distance of the mandible provides good evidence of sex identification due to dimorphism. This study was undertaken to evaluate the effectiveness of canine index (CI) in the determination of sex.

1. Introduction

Identification through 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.[1] In the case of mass disasters the problem of identity of the dead arises in the case of dismembered or mutilated bodies. Numerous methods using various body parts are in use to establish the identity in such cases. Most of these methods have their own merits and limitations. But 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.

Almost all teeth are used in establishing one or the other parameter of identification. Teeth dimensions are widely used to establish the sex of the individual. Canines, the most stable teeth bear the greatest degree of sexual dimorphism and play a highly valuable role in identification. Hence, their exclusive use in odontometric sex assessment using the tooth dimensions and canine index (CI) has been advocated before. The present study establishes the impact of the canines in medicolegal identification. The study defines the canine index in the South Indian population.

2. Materials and methods

The present study consisted of 500 students comprising 250 males and 250 females in the age group of 15–25 years belong-

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ing to South India. This age group was selected as all canines would have erupted by this age and attrition is expected to be minimal[2] and also the inter-canine distance is fixed by the age of 12 years.[3] Methods of study consisted of measuring the mandibular and maxillary canine widths and inter-canine distance of respective jaws in these students.

2.1. Exclusion criteria

Subjects with the following status of teeth were excluded from the study.

1. Abnormal teeth alignment
2. Missing anterior teeth
3. Crowded or excessive spacing in the anterior teeth
4. Abnormal over jet and overbite
5. Caries teeth
6. Bad/poor oral hygiene
7. Canine teeth with attrition
8. Subjects with orthodontic treatment
9. Any trauma to canine teeth

After selecting the subjects randomly and explaining aims of the study to them, written informed consent was obtained in the prescribed form. Measurements were taken intra orally on either side of the jaw using a digital callipers with a resolution of 0.01 mm with the provision to fix it in the desired position so as to avoid any errors in recording the exact measurements of canines and a divider with pointed tips. The following measurements were taken in the subjects with the oral cavity wide open.

- **Mesio-distal crown width of canines:**[4] (Fig. 1)

Using a divider, the greatest mesio-distal width of a canine tooth at a contact point with the adjacent teeth was taken and the value was measured by placing the two pointed ends of the divider in between jaws of the digital caliper and measurements were noted.

- **Inter-canine distance:** (Figs. 2 and 3)

The inter-canine distance was measured using a digital caliper by placing the two pointed ends of its jaws over the canine tip and values were noted (direct method).

Figure 2 Measurement of inter-canine distance (direct method).

The inter-canine distance was also measured using coloured drawing sheets (indirect method). The subject was asked to open his/her mouth wide. The coloured drawing sheet was placed between the acrylic sheet and black carbon paper and positioned in the oral cavity as shown in the figure (Fig. 3). Then the subject was asked to bite these sheets firmly and the impressions of the incisal surfaces of the teeth were obtained on the drawing sheet. Using the digital caliper, the inter canine distance markings on the drawing sheet, corresponding to the canine teeth were measured, and values noted, as shown in the figure (Fig. 3). Yellow and pink coloured drawing sheets were used to take the impressions of the maxillary and mandibular teeth respectively. In case of non-pointed impression of the canine, the midpoint of the impression was considered for inter-canine distance.

Readings obtained were subjected for analysis to derive conclusions. Further the canine index and standard canine index were calculated for all the four canines using the formula cited by Muller et.al.[5]

$$\textbf{Canineindex} = \frac{\text{Mesio} - \text{distal crown width of canine}}{\text{intercanine distance}}$$

$$\textbf{Standardcanineindex} = \frac{(\text{mean male CI} - \text{SD}) + (\text{mean female CI} + \text{SD})}{2}$$

Figure 1 Measurement of mesio-distal width of the canine.