INTRODUCTION

Forensic odontology is a branch of science dealt with investigations of age estimation and bite mark. Alike with medicolegal cases, forensic odontology dealt with dentolegal cases. How teeth identification plays a major role in forensic sciences was evident from the story of ancient Roman Emperor Claudius of the 1st century. The odontological examinations have been a critical determinant in the search for the identity of individual remains.

Dental maturity has played an important role in estimating the chronological age of individuals. Age estimation is a subdivision of forensic sciences and should be an important part of every identification process, especially when information relating to the deceased is unavailable. Forensic odontologist helps in identification of deceased victims by age, sex, and race determination from teeth and skull. Since the scope of forensic odontology is very broad and challenging, dental surgeons trained in forensic odontology can make unique contributions in the administration of justice, which is the keynote of democracy.

Teeth are a hardest mineralized structure in the human body which plays important role in mastication, speech, and esthetics. Teeth also support labial and buccal musculature of the face. Edentulism can cause loss of vertical dimension of the face and decreased lip muscle tonicity, difficulty in speech and mastication, poor esthetics, residual ridge resorption, and collapse of facial musculature. Various methods are applied to estimate teeth size like pre-extraction records which

ABSTRACT

Introduction: Gender determination of skeletal remains is a part of archaeological analysis and medicolegal cases. The method of identification may vary, but the ultimate goal is to determine the gender of suspecting skeletal remains. The identification of skeletal remains gains utmost importance in cases of mass fatality such as in earthquakes, tsunami, cyclones, and flood. The aim of this study is to determine and evaluate the usefulness of intercanine and width of intermolar arch of the maxilla for gender determination. Materials and Methods: The sample size was of 60 volunteers with equal gender distribution, aged between 18 and 35 years in Saveetha Dental College. A Vernier caliper was used to measure the intercanine and intermolar distance, and the measurements were recorded and analyzed statistically. Results: Intercanine width in maxillary arch for male and female was 34.22 ± 1.50 mm and 34.49 ± 1.40 mm, respectively, with t value of 4.00. Intermolar width in maxillary arch for male and female was 46.74 ± 2.09 mm and 49.44 ± 1.82 mm, respectively, with t value of 6.13. On using the receiver operating characteristic curve to deduce sensitivity and specificity of the measurements taken, maxillary intermolar arch width gave high specificity of 92% with the best sensitivity, i.e., 64%. Conclusion: Based on the results, the intermolar arch width may be useful in determining the gender of dental remains accurately or of individuals with missing canine teeth. It may be more accurate in gender determination than intercanine arch width in the maxilla.

KEY WORDS: Forensic odontology, Gender distribution, Intercanine distance, Intermolar distance
include old photographs, radiographs, and dental cast, and the efforts are made by dentist to give as natural appearance with the help of artificial teeth. Proper shade selection, shape, and size of teeth are necessary as per sex, personality, and age.

As unique as fingerprints, dentition also serves the same and used in the identification of individuals. The dentition’s use in gender determination has been explored and advocated owing to its strength and resistance to various insults. As teeth are the hardest and chemically the most stable tissue in the body, they are an excellent material in living and non-living populations for forensic investigations.\[1\] Hence, tooth size standards based on odontometric investigations can be used in determining the age and particularly the gender. With such tooth size standards, whenever it is possible to predict the gender, identification is simplified because then only missing persons of one gender need to be considered.\[2\] In this sense, identification of gender takes precedence over the age. Sexual dimorphism refers to those differences in size, stature, and appearance between male and female that can be applied for individual identification.

Canines, in particular, have the greatest degree of sexual dimorphism, rendering them highly valuable in identification. Mesiodistal width of canine,\[3,4\] intercanine width,\[2\] and mandibular canine index (MCI)\[5\] have been proved highly valuable in gender identification. Hence, this study aims to determine and evaluate the usefulness of intercanine and intermolar arch width of the maxilla for gender determination. Interdental arch width and arch length have been helpful in various studies for gender determination, anthropometric analysis, and orthodontic treatment planning.

**MATERIALS AND METHODS**

The research was conducted at Saveetha Dental College in Chennai. The sample size was of 50 volunteers with equal gender distribution and aged between 18 and 35 years.

**Inclusion Criteria**

1. Signed informed consent from compliant volunteers.
2. Volunteers in good general health.
3. Presence of two canine teeth and two molars in the upper jaw.

Fifty subjects consisting of 25 males and 25 females, as per inclusion criteria, were selected for the study. The patient was evaluated clinically. Patients with normal overjet and overbite, with absent spacing in the anterior teeth, and with normal molar and canine relationship were included in the study. Patients with the presence of partially erupted teeth, with deleterious oral habits, and having teeth with severe attrition were excluded from the study. Once a person was selected, a written consent was obtained from the patient after explaining the procedure and the purpose of the study. After that, the patient was comfortably seated on the dental chair and height adjustment done before wearing gloves. Maxillary impressions were made with alginate using universal precautions for infection control.\[6\] The study models were prepared in dental stone and used for analysis. On study model, the following measurements were made for all subjects using Vernier caliper. The measurements taken included: Maxillary intercanine [Figure 1] and intermolar [Figure 2] arch width. The intercanine arch width was calculated from the cusp tip of the canine on one side to the cusp tip of the canine on the opposite side,\[3,4\] while the internolar arch width was calculated from the central fossa of the first permanent molar on either side.

**RESULTS**

In this study, arithmetic means were calculated for intercanine and intermolar arch width in maxillary arches for males and females. Student t-test was used to compare the means of the intercanine and intermolar width in maxillary and mandibular arches for males and females. All the comparison of means
done was significant with \( P < 0.05 \). Intercanine width in maxillary arch for male and female was 34.22 ± 1.50 and 34.49 ± 1.40, respectively, with \( t \) value of 4.00. Intermolar width in maxillary arch for male and female was 46.74 ± 2.09 and 49.44 ± 1.82, respectively, with \( t \) value of 6.13 [Tables 1 and 2].

Receiver operating characteristic curve was used to deduce the sensitivity and specificity of the measurements to determine gender correctly [Graph 1]. On using the curve to deduce balanced sensitivity and specificity values with high specificity, maxillary intermolar arch width gave high specificity of 92% with best sensitivity, i.e., 64%.

**DISCUSSION**

With an increase in the number of natural, as well as man-made calamities such as earthquakes, floods, wars, and riots, the need to correctly identify the remains of dead individuals has increased. Individual identification depends on different parameters such as age, gender, and race. Gender determination is one of the important steps employed in the identification of an individual. If the sex of the individual is evaluated, either male or female and if identified accurately, the total number of missing or lost victims can be confined to just half of the total population of both the sexes.[2] In forensic cases, it is common to recover partial remains such as fragmented skull, jaws, and other bones of the body. The teeth being one of the strongest human tissues are known to resist a variety of antemortem and postmortem insults and are one of the most commonly recovered remains. Mesiodistal width of canine,[3,4] intercanine width,[2] and MCI[5] have been used to determine gender in the past and are supported by many researchers. However, recent research by Acharya *et al.*[7,8] and Boaz *et al.*[9] has found that these measurements do not reflect the gender difference accurately. In anthropology, the analysis of dental wear is the most commonly used method.[10] Furthermore, these measurements are not useful in individuals with missing canines. In such cases, width of molars or intermolar arch width may be used in gender determination.[1] Hence, in our study, intermolar arch width was used to determine the gender, and the results were compared with intercanine arch width to assess a better method to determine gender correctly. In our study, the mean intercanine width in maxilla and the mean intermolar width in maxilla were significantly higher in males than females. This observation is in agreement with the study done by other authors,[11-13] wherein they stated that boys have wider teeth and larger upper and lower inter-molar width than girls. This may be because the dental arch width reflects the size of the basal bone and since males, in general, are larger than females; the same would reflect itself in the basal bone of the jaws and the dental arches.

There was no significant difference between the mean mandibular intercanine widths between male and female.[12,14] Since crowding tends to decrease the anterior dental arch width and crowding is more common in mandibular anteriors, this could be the reason for the above-mentioned finding. However,
this observation is in disagreement with a study done by Hussein et al.,[11] as they found the mandibular intercanine width to be greater in males. On comparing the means, the maxillary intercanine and mandibular intermolar arch widths were found to have high t values and were found to be quite useful in determining the gender. This was due to a significant difference in the arch width between males and females. However, in our study, the maxillary intermolar width was found to have the highest t value, which was due to the most significant difference in the values of intermolar arch width in males as compared to females, making it the most useful measurement to determine gender correctly.

The sensitivity to determine gender correctly was high for mandibular intermolar arch width, i.e., 92% with a satisfactory specificity of 76%. However, in forensic and medicolegal examinations, high specificity is required, to eliminate inaccurate identification and to prevent prosecution of innocent individuals. In our study, maxillary intermolar arch width was found to have the highest specificity of 92% in determining the gender correctly along with a satisfactory sensitivity of 64%. Thus, the maxillary intermolar width had both high specificity and high t value, and this measurement may be used to determine gender correctly.

**CONCLUSION**

Although the odontometric measurements based on canines are quite popular and have been substantiated from time to time for determining gender, these are rendered invaluable where canines are absent. In such cases, where molars are present, these teeth may be used to determine gender. On the basis of the results of our study, we may conclude that maxillary intermolar arch width may be useful in determining the gender of dental remains accurately, of individuals with missing canine teeth, and also it may be more accurate in gender determination than intercanine arch width, with maxillary intermolar arch width being more specific.

**REFERENCES**


Source of support: Nil; Conflict of interest: None Declared