

## GENDER DETERMINATION USING CONDYLAR HEIGHT- AN ORTHOPANTOMOGRAPHIC STUDY

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### ABSTRACT:

**Introduction:** Forensic science, also known as criminalistics, is the application of science to criminal and civil laws, mainly on the criminal side during criminal investigations. A condyle is the round prominence at the end of a bone, most often it is considered to be a part of a joint in an articulation with another bone. Aim of this study is to determine the efficacy of condylar height of mandible in gender determination using orthopantomograph

**Materials and method:** This study was conducted using digital panoramic images of 20 OPGs each of both genders. The OPG's collected roughly belong to the age group of 30-40 years. Condylar height was calculated using a computerised software. Statistical analysis was done using SPSS Software.

**Result:** On tabulating and statistically analysing the values obtained from the OPG's collected, it was found that the condylar height of the females were smaller than the males. On applying an independent t- test for both the genders, the p - value was found to be 0.102, which is statistically insignificant ( $p > 0.05$ ).

**Conclusion:** Condylar height was smaller in females when compared to males. Condylar height can be considered as an useful aid for sex determination as it is readily available and resistant to any disintegration process.

**Key words:** Condylar height, Forensic, Forensic odontology, Gender determination, mandible, Orthopantomogram, innovative technology, novel method

### INTRODUCTION:

Forensic science, also known as criminalistics, is the application of science to criminal and civil laws, mainly on the criminal side during criminal investigations, as governed by the legal standards of admissible evidence and other criminal procedure. The history of this term originates from Roman times, when a criminal was charged and was made to present the case before a group of public individuals. Both the person who was accused of the crime and the accuser would have to give speeches based on their sides of the story. The decision would favor the individual with the best argument and delivery. Forensic scientists are those who collect, preserve, and analyze scientific data during the course of an investigation. Few forensic scientists travel to the scene of the crime to collect the evidence by themselves, but few others occupy a laboratory role and perform analysis on objects that were brought to them by other individuals.

A condyle is the round prominence at the end of a bone, most often it is considered to be a part of a joint in an articulation with another bone. It is one of the markings or features of bones such as the mandible, femur and knee joint (1). The mandibular condyles are smaller in females. There are well marked differences in the bony pelvis and skull. Mandible remains in the human will also help us in the identification of age, sex, and race (2). Mandible and its variations in age, sex and race will help the physicians, surgeons, medico-legal authorities and even the anthropologists to give correct interpretations for the results of any diagnostic procedures in living (2-4).

Gender identification is important in medico-legal and anthropological work. It was found that the sex determination based only on characteristics of teeth and their supporting structures had been a difficult task where as X-ray examination of the mandible gives definitive information about the sex. After reaching puberty, sex determination becomes more precise.

There were numerous studies which have been conducted to test the efficiency of mandible in determining sex worldwide. To date, very less study has been carried out on gender determination using condylar height in India (5-8).

Our team has extensive knowledge and research experience that has translated into high quality publications (9-28) Aim of this study is to determine the efficacy of condylar height of mandible in gender determination using

orthopantomograph. The findings of this study will provide a platform to evaluate the ability of selected parameters to determine the sex in forensic sample.

#### MATERIALS AND METHOD:

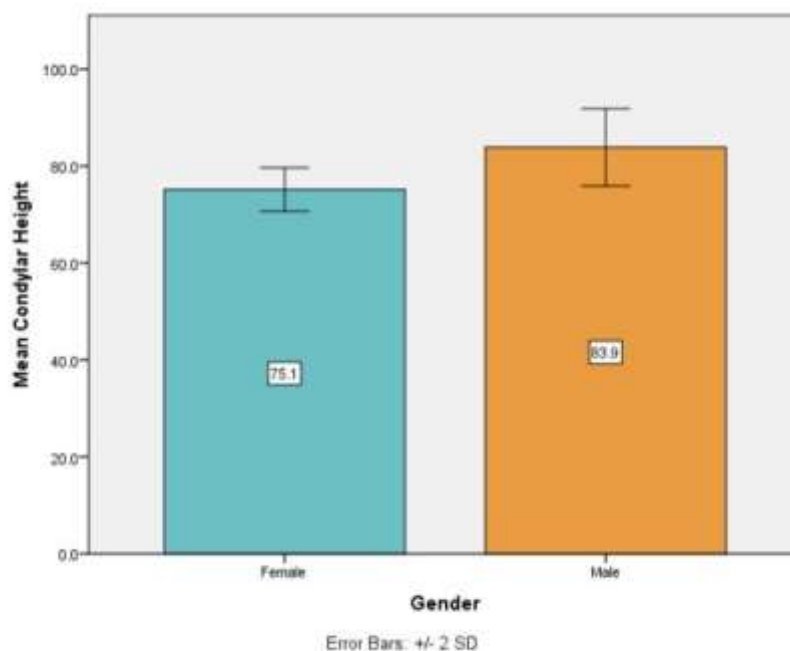
The study included 20 orthopantomograms of known sex that were collected from the Department of radiology in Saveetha Dental College. The OPG's collected roughly belong to the age group of 30-40 years. Panoramic radiographs showing pathological fractures, developmental disturbances of the mandible and edentulous mandible were excluded from the study. Condylar height were noted using a computerised software. The collected data was analysed statistically for its significance between the male and female population using the SPSS tool.



Figure 1: Measurement of condylar height in an orthopantomograph

#### RESULT:

On tabulating and statistically analysing the values obtained by measuring the condylar height in the OPG, the following bar graph was obtained. It was noted that mean condylar height between both males (mean value -83.86) and females (mean value - 75.14). It was observed that females had smaller condyles compared to the males. On applying an independent t- test for both the genders, the p - value was found to be 0.102, which is statistically insignificant ( $p > 0.05$ ). (Figure 2)



**Figure 2:** The bar graph represents the association between the mean condylar height and gender. X axis represents the gender and Y axis represents the mean condylar height. Blue denotes female and orange denotes male. Males have greater

condylar height when compared to females. The p - value was found to be 0.102 (  $p > 0.05$ ). Hence, it is statistically not significant.

#### **DISCUSSION:**

In the case of mass fatality incidents, the human remains are disfigured beyond recognition, in such cases personal identification along with gender determination remains critical. (29). Sex determination can be 100 percent accurate when the skeleton is accessible for investigation without severe damage, however in case of disasters we usually find only fragmented bones, and sex determination becomes difficult. (30). Our study showed that condylar height was smaller in females when compared to males. According to one of the previous study conducted, the author stated that gender was correctly determined in 32 of sixty male mandibular measurements, with a prediction accuracy rate of 53%, and 36 of sixty female mandibular measurements, with a prediction accuracy rate of 60%. (31).

According to another study, height of coronoid has the best potential for gender determination among Indians, with a 74.1% accuracy, and when combined with maximum ramus breadth, mandibular ramus length and minimum ramus breadth, it shows significant gender dimorphism with an overall accuracy of 80.2%. (32) According to a study conducted by another author, the ramus exhibits high sexual dimorphism (33)

Along with condylar height, other parameters like mandibular ramus is useful aid for sex determination as it is readily available and resistant to any disintegration process (34). The morphometric examination of mandibular ramus utilising digital OPG functioned as a significant and valuable aid for sex identification up to a certain extent, according to Chandramani's study, although social and environmental factors altered the growth and structure of the mandible. (33). Along with condylar height other parameters of mandible can be included for prediction of sex in forensic analysis and anthropology especially in situations where the availability of soft tissues is questionable for analysis. Limitations of this study were less sample size and homogenous population. Further studies should be conducted to generalize the findings.

#### **CONCLUSION:**

Condylar height can be considered as an useful aid for sex determination as it is readily available and resistant to any disintegration process. Orthopantomographs were found to be reliable when all condylar height measurements were carried out for determination of sex.

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**CONFLICT OF INTEREST:** The authors have none to declare.

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