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Conventional Frontal Sinus Imaging In Identification Of Sex : Original Study In Population Of Udaipur City ,India .

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ABSTRACT

Accurate sex prediction of human remains enables a more focused search of missing person's files. The frontal sinus radiographs is useful in sex assessment of the bodies remain only with skull. The frontal sinuses are absent at birth, but are generally fairly well developed between the seventh and eighth years, only reaching their full size after puberty, that's why in our study mean age of subject were 21 year of age . A total of 40 frontal sinus view radiographs of 20 males and females each were evaluated for potential differences in frontal sinus configuration including height and width of frontal sinus. Data were assessed through Students-T test. A highly significant difference was observed in both width and height of frontal sinus between males and females. The results here in suggest that frontal sinuses can be used as one of the aids for prediction of sex.

Keywords:

Forensic anthropology, skeletal identification, Caldwell technique , Frontal sinus.

INTRODUCTION-

Forensic anthropology is the application of the science of physical anthropology and human osteology in a legal setting, most often in criminal cases where the victim's remains are in the advanced stages of decomposition to assist in the recovery of remains, assess age, sex, stature, ancestry, race, and analyze trauma and disease. Various parameters like craniofacial height, mastoid height, bicondylar width, mandibular width and evaluation of width and height of frontal sinus. The frontal sinus is a cavity present inside the frontal bone; among the paranasal sinuses. It is of significance in forensic identification due to its irregular shape and because of individual characteristics which make the frontal bone unique for every individual, just as with fingerprints¹ even for monozygotic twins. It starts developing embryonically from an ethmoidal cell during the second year of life, reaching its maximum size at the age of twenty, and remaining stable through the rest of the life.

The determination of gender of unknown persons is of vital importance in forensic investigations, such especially in cases where only fragments of the skull remain and there is no possibility of identification based

on the dental arch. The correlation of the morphology of the frontal sinus with gender shows that the frontal sinus is smaller in women², an aspect that points out its unique characteristic and importance in human identification, as well as in the determination of age.

The aim of the present study was to determine the gender of individuals from measurements of the frontal sinus and to identify the variation in frontal sinus morphology, if any, between male and female subjects.

MATERIALS AND METHODS-

40 subjects (20 male and 20 females) with mean age of 21 years who were previously examined and evaluated with respect to anatomic and physiologic integrity of the frontal sinus with no history of orthodontic treatment or orthognathic surgery, trauma, or any surgery of the skull, history or clinical characteristics of endocrine disturbances, nutritional diseases or hereditary facial asymmetries were included in the present study.

The radiographs were taken by Caldwell technique to view the frontal sinus utilizing Kodak radiographic film, size 8'x 10' inches. Radiography was performed with a PLANMECA apparatus with a distance of 1.52 m from source to film, using an exposure of 80 KVP and time of 2 s at 12 mA (figure 1). In all the radiographs, the lines that bordered the area of the frontal sinus (figure 2) were determined with the help of a radiograph viewer and tracing paper, where the lower border (superior border of the orbit) of the frontal sinus was previously standardized (figure 3). The greatest height of frontal sinus was determined from the maximum distance between the base and upper lines of the frontal sinus, and the largest width of the frontal sinus was determined from the maximum distance between the lateral most lines of the right and left side of the frontal sinus. The linear measurements obtained from each radiograph were expressed in lineal millimeters up to the accuracy of 0.5mm. The data were analyzed by Student's t-test for comparison of the means of the dimensions measured for the two genders.



..Figure 1- Patient positioning

Figure 2- Frontal sinus radiograph

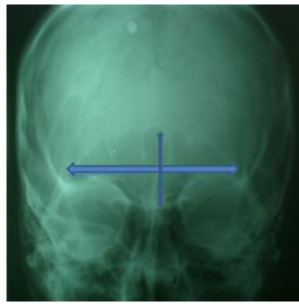
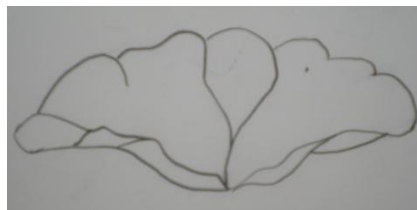


Figure 3- Tracing of frontal sinus

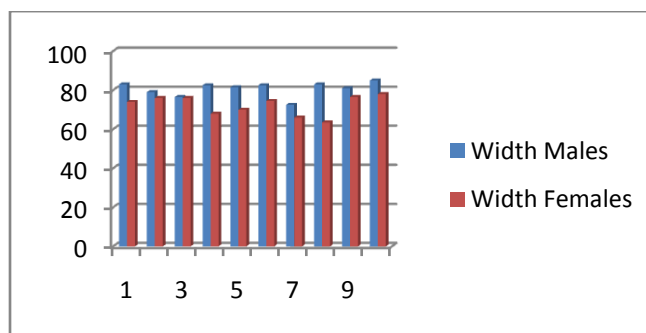


RESULTS-

Student’s t-test showed statistically significant difference ($p < 0.00$) between the widths of frontal sinus, indicating greater width of males as compared to females (Table-1) (graph 1).

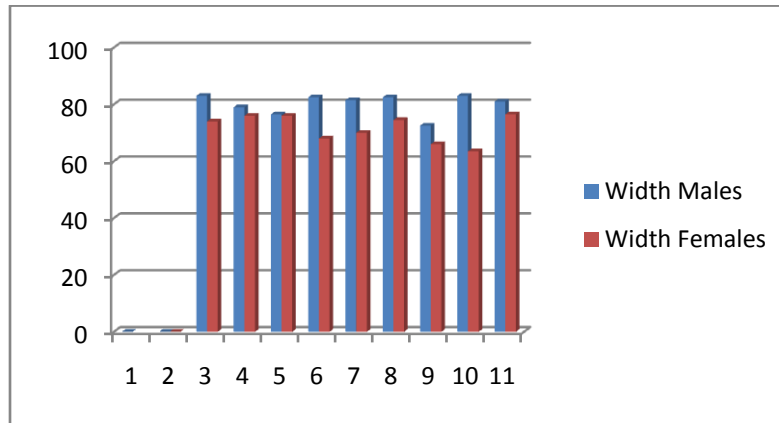
Width of frontal sinus	mean	P value
Males	80.65	0.00
Females	72.25	

Graph 1-Comparison of width of frontal sinus between males and females.



The mean height of frontal sinus in males was 38.5 mm and 33.1 mm in females (graph 2). Highly significant difference ($p=0.00$) was observed when height of frontal sinus in males was compared to that of females.

Graph 2- Comparison of height of frontal sinus between males and females.



The above results indicated that both the width and height of frontal sinus was more in males as compared to that of females.

DISCUSSION-

There are currently many techniques used in forensic science to identify an unknown person, the most reliable being DNA analysis. However, this method is time consuming as well as expensive, and may not be possible if the remains are extremely degraded, or exposed to extreme environmental conditions. In such cases other methods can be used like radiographic evaluation of frontal sinus, especially in cases where only skull remains are available. Radiographs of frontal sinuses are successfully used in today's forensic medicine for identification of a person because of its uniqueness every individual even among monozygotic twins.

The frontal sinus is absent in only 4% of the population and presents distinctive variations in shape, area, and symmetry, thus becoming an important parameter to determine gender dimorphism³ and allow subject identification.

Development of frontal sinus is usually completed by about of age of 18-20 years. It has an anatomically special characteristic configuration showing variations in individuals in addition to gender. In the present study individuals included were above age of 20 years were to exclude the possibility of incomplete growth which may lead to false results⁴.

The results of present study showed that width of frontal sinus was more in males as compared to females similar to Ponde et al (2003)⁴ who also found a significantly higher antero-posterior diameter in males.

Nortjie and Harris⁵ used PA view for correct sex identification with accuracy of 88% in the present study Caldwell technique was used. It was found that the height of frontal sinus was more in males as compared to females

Result of our study indicated that size of frontal sinus (width and height) is more in males as compared to females. A similar study was done by Camargo JR et al in 2007¹. The morphological differences in the cranium between the two genders are determined mainly by genetic factors, more so than nutritional, hormonal or muscular. Such aspects can explain why the frontal sinus of men is on average larger than that of women⁶.

CONCLUSION-

From our study we can conclude that frontal sinus could be used as one of the aids for personal identification. Moreover, the method used for identification was simple and not time consuming. It could be easily employed by a general dentist, as it did not require expertise.

Hence within limitations of this study it can be concluded that frontal sinus is an important landmark which is now routinely been used by forensic scientists. Though the size of frontal sinus shows individual variations but the gender variation is well established and is routinely used in anthropological studies.

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