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Original Research Article

GREATER SCIATIC NOTCH AS AN INDICATOR OF SEX IN HUMAN DEAD FETUSES OF SOUTH INDIAN ORIGIN

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ABSTRACT

Background: Unfortunately, in the forensic context there are cases involving fetal and neonatal skeletal remains. Accurate sex estimation of these remains can be very important to medicolegal authorities. The present study was aimed to determine the sex of the fetal pelvis by the morphometric analysis of greater sciatic notch.

Materials and Methods: The study was carried out on 100 fetal hip bones extracted from 50 fetuses (25 female; 25 male). Morphometric analysis was carried out on the greater sciatic notch. The width and depth of the greater sciatic notch were recorded and the Index was calculated.

Results: Statistically significant difference was found between the female and male greater sciatic notches in relation to width, depth and index. Female greater sciatic notches were wider than the male and the male notches were deeper than the female. The greater sciatic notch index shows sexual dimorphism with 100% accuracy.

Conclusion: Accurate sex estimation of fetal remains can be very important to medicolegal authorities in forensic analysis. With the results of the present study the greater sciatic notch width, depth and the index can be taken as a best parameter in sex determination of fetal skeletal remains.

KEY WORDS: Greater sciatic notch, sex determination, Pelvis, Fetus, Sexual Dimorphism.

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INTRODUCTION

Age, sex and stature are the three important factors in forensic science in identification of humans [1. Estimating sex from skeletal remains is a key step in the identification process in both forensic and archaeological contexts. Sex determination is the first component of the biological profile to be assessed because elements like age, stature, and sometimes ancestry are dependent on it [2]. Literatures suggest that the innominate bone displays the greatest degree of sexual dimorphism in humans, making it the ideal bone for sex estimation [3-5]. Among human bones the pelvis and the skull are the most reliable source for sex determination [1]. The sexual dimorphism in the shape and size of

the pelvis is very high because of females giving birth to large-brained infants, under the constraints of the human trait of bipedal organization to the pelvis and lower limbs [6-8]. The human females pelvis undergoes osteological compromise between upright locomotion and birthing large-brained infants is visible in the greater size and shape of the pelvic inlet [9,10].

In pelvis among all the other iliac features, traits the greater sciatic notch have several advantages as the greater sciatic notch is recognizable early in fetal development. Literatures have shown a statistically significant level of sexual dimorphism in greater sciatic notch [11]. The shape and size of the greater sciatic notch is directly correlated with the size of the pelvic inlet. Based on this correlation, multiple studies have demonstrated that the greater sciatic notch is highly accurate for estimating sex when used alone [12-14]. Several studies concentrated on sexual dimorphism of greater sciatic notch in adults, juveniles and fetuses of different populations [15,16]. The present study aims at sex determination of fetal pelvis based on width, depth and index of greater sciatic notch in south Indian population.

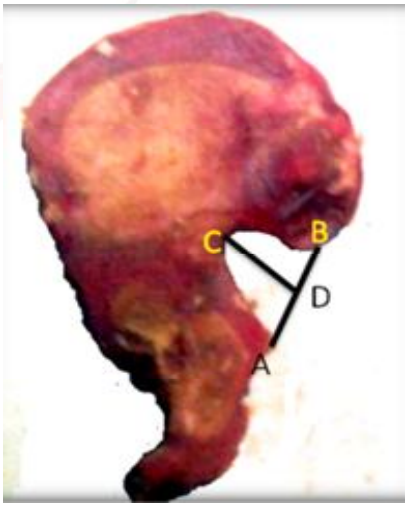
MATERIALS AND METHODS

The present study was carried out on 50 human dead fetuses (25 female; 25 male) collected from maternity wing of Gandhi Hospital, Secunderabad with the permission acquired from authorities and Ethical committee. The fetuses were collected at the earliest after death and embalmed immediately to avoid purification. The fetuses were numbered and examined for any gross morphological abnormalities. Only fully formed fetuses with the crown heel length of 39cm and above were included in the study. The fetuses with morphological abnormalities and underage were excluded from the study.

The length of the fetuses was measured by using infantometer by keeping the fetus in supine position. The bony pelvis was dissected in all the fetuses by removing all the soft tissues covering it (Figure 1). The obtained hip bones were soaked in the caustic soda for 3 to 4 hours and washed in the running tap water and allowed todry for a week. The dried hipbones are numbered gender wise. From 50 fetuses 100 hip bones were collected and morphometry was carried out on 100 greater sciatic notches. On each hip bone, four points are marked as follows – A. Sciatic spine, B. Posterior inferior iliac spine, C. Maximum depth of sciatic notch and D. Perpendicular line over the A and B touching the maximum depth sciatic notch. The maximum width of greater sciatic notch was measured from A to B and the maximum depth of the greater sciatic notch was measured from D to C (Figure 2).

Fig. 1: Showing the fetal pelvis after dissection.

Fig. 2: Showing various landmarks on hip bone to measure the width and depth of greater sciatic notch.



RESULTS

The width of greater sciatic notch in female fetal pelvises was ranging from 13.0 to 17.9mm whereas in male fetal pelvises it was 11.8 to 16.0mm. The depth of the greater sciatic notch in female fetal pelvises was ranging from 4.8 to 7.4mm whereas in male fetal pelvises it was 6.5 to 9.0mm. The width of the greater sciatic notch is significantly larger in female foetal pelvises when compared to male fetal pelvises (Fig.3).

Statistically significant difference was observed between the male and female fetal pelvises in relation to the width of greater sciatic notch (t=3.91; p = 0.0003). The depth of the greater sciatic notch is significantly deeper in male fetal pelvises when compared to female fetal pelvises (Figure 4).

Fig. 3: Female fetal hip bone showing wider greater sciatic notch.

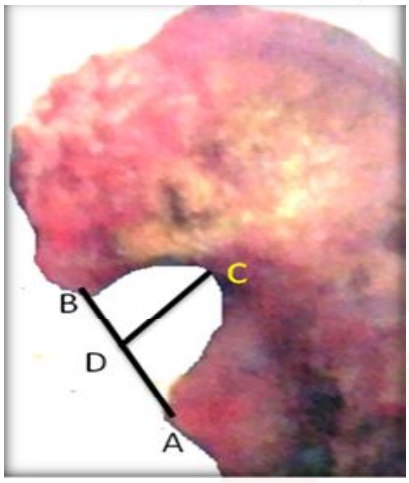
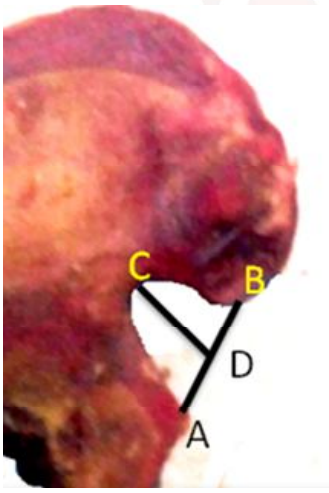


Fig. 4: Male fetal hip bone showing deeper greater sciatic notch.

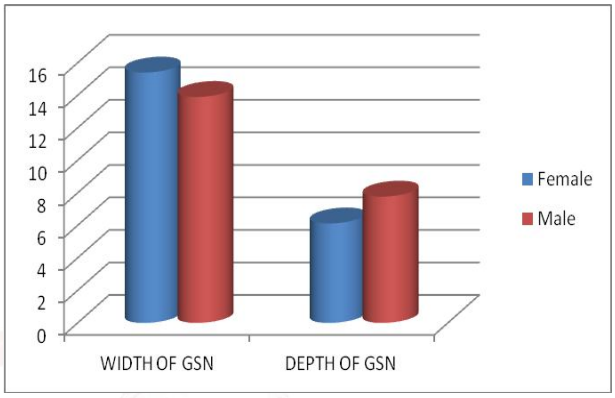


Statistically significant difference was observed between the female and male fetal pelvises in relation to the depth of greater sciatic notch (t=7.80; P = 0.0001). The greater sciatic notch index was calculated for each specimen and it was ranging from 39 to 49 in female fetal pelvises and 56 to 54 in male fetal pelvises. There was a statistically significant difference between male and female fetal pelvises related to greater sciatic notch index (t=15.4; p= 0.0001). The average width, depth and index of greater sciatic notch were recorded in Table 1 and figure 5.

Table 1: Showing the sex differences in the parameters of greater sciatic notch.

Gender/Parameters	Width of greater sciatic notch	Depth of greater sciatic notch	Greater sciatic notch index
Female	15.4±1.33	6.12±0.68	45.5
Male	13.9±1.35	7.77±0.78	54.9

Fig. 5: Bar diagram showing the gender variation in the parameters of greater sciatic notch.



DISCUSSION

The pelvis is generally accepted as the most sexually dimorphic region of the human skeleton and the greater sciatic notch is an important feature which is most commonly used as a reliable source for sex estimation as it is recognizable early in fetal development [4,11,13,14]. The present study focused on the sexual dimorphism in greater sciatic notch in south Indian fetuses.

Many studies were carried out on sex determination by using various parameters on pelvic bone including greater sciatic notch. Hideo Takahashi found that the sex determination can be done by using various parameters of greater sciatic notch with 88% accuracy in Japan Population, Akpan et al., with 75 to 90% accuracy in Nigerian population, and Rajangam et al., with 87.7% accuracy in Karnataka origin of South Indians. Very few studies were performed on fetal pelvis [17-19].

The results of the present study correlates with Derry et al and Fehling et al., where the width of the greater sciatic notch is significantly larger in female fetal pelvises when compared to male fetal pelvises. The depth of the greater sciatic notch is significantly larger in male fetal pelvises when compared to female fetal pelvises. Statistically significant difference was observed between the male and female fetal pelvises in

relation to the width and the depth of greater sciatic notch [20,21].

The greater sciatic notch index observed to be clearly an indicator for sex determination as at a higher figure to 56 in males compared to 39 to 49 in females. The index of greater sciatic notch in the present study determines sex with 100 % whereas width, depth of greater sciatic notch was with 90% and 75% accuracy respectively.

CONCLUSION

With the results of the present study the greater sciatic notch width, depth and the index can be taken as a best parameter in sex determination of fetuses. Among the entire parameters index was the best parameter with 100 % accuracy. The data provided in the present study would be helpful in sex determination of fetal skeletal remains in forensic analysis and anthropological studies.

Conflicts of Interests: None

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