SEXUAL DIMORPHISM IN GREATER SCIATIC NOTCH - A MORPHOMETRIC STUDY

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ABSTRACT: The sex of an individual is a basic biological attribute that must be taken into consideration in human population studies. There are metric variations in the expression of sexual dimorphism. The pelvis is most sexually dimorphic and is the first bone assessed in sex determination because it is the skeletal element most affected by reproduction and parturition. Portions of the pelvis that are more resistant to damage can be used to determine the sex of an individual, such as the greater sciatic notch and auricular surface of the ilium. The features of the greater sciatic notch are characteristic and highly sexually dimorphic. **AIMS & OBJECTIVE:** To compare the different parameters of greater sciatic notches for sexual dimorphism and correlate this study with the similar studies done in the past. **MATERIAL & METHODS:** The study was done on 46 hip bones of adult individuals of known sex from the museum of department of Anatomy of TMMC&RC Moradabad and nearby medical colleges of same geographical strata. The instrument used was tri-flanged stainless steel caliper. **ANALYTICAL TEST:** Student's t test. **RESULT:** Max width (R) M/F=33.8/45, (L) M/F=34.1/43.3. Max depth (R) M/F=25.6/24.7, (L) M/F=26.5/24.2. Posterior segment of width (R) M/F=28.9/24.7, (L) M/F=28.0/22. Index-1(R) M/F=74/55, (L) M/F=78/57. Index-2 (R) M/F=85/55, (L) M/F=82/50. **CONCLUSION:** There was a non-significant difference in maximum width of greater sciatic notch of male and females on right side, but a significant difference was found in the maximum width of male and females notches on the left side and same is true for maximum depth also. The posterior segment of width differed significantly on the right side while on the left side the difference was non-significant. A significant difference was also noted both in index-I and index –II of male and females greater sciatic notches on both sides.

KEY WORDS: Greater sciatic notch, tri-flanged stainless steel caliper, sexual dimorphism.

INTRODUCTION: One of the basic goals in anthropology is the assessment of the biological profile, which includes the assessment of sex of a given individual. After the skeletal remains in question are determined to be human, the next question is usually sex determination, as this eliminates approximately 50% of the reported missing individuals from further consideration.

Though, in modern human populations, anatomically there is slight sexual dimorphism. However, primary differences can be observed in osseous elements. The creation of skeletal anthropometric measurements of different populations is useful for both comparisons with similar studies done in past and for improving the identification process of human skeletal remains. Researchers often identify the pelvis as the most accurate element of the skeleton used to assess sex due to the many morphological changes it undergoes during puberty. The pelvis is most sexually dimorphic and is the first bone assessed in sex determination because it is the skeletal element most affected by reproduction and parturition. (1) Portions of the pelvis that are more resistant to damage can be used to determine the sex of an individual, such as the greater sciatic notch and

auricular surface of the ilium. (2) Pelvis has always been the most commonly used bone, providing the most accurate results.

Current opinion regards the hip bone as the most reliable sex indicator because it has long been recognized as the most dimorphic bone, particularly in adult individuals. (3,4) According to Krogman W.M. and Iscan M.Y., 95% accuracy can be obtained if the pelvis is complete, although Bruzek J. found that accuracies ranged from 59% to 96%. (4, 5) The best methods for determining sex from adult skeletal remains involve measurement and inspection of the hip bone that presents a number of gender-related anatomical differences. (6) In the past, many workers have evolved various parameters and indices for sexing of hip bone. (7-16) The features of the greater sciatic notch are characteristic and are commonly used for sexual dimorphism.

Osteologists vary widely in their experience with known collection of sex determining parameters, and this undoubtedly influences the amount of weight they give in sex determination to the differences in the shape of the greater sciatic notch. Such inconsistencies make demographic comparisons of collections studied by different investigators difficult.

MATERIAL & METHOD: This study was done on 46 (24 Male & 22 Female) hip bones of adult individuals of known sex from the museum of department of Anatomy of TMMC&RC Moradabad and nearby medical colleges of same geographical strata. All linear measurements were made in millimeters on the intact parts of normal bones. Data collected were tabulated according to gender and sides and statistically analyzed. Measurements were taken with the help of a tri-flanged stainless steel caliper. (Fig. 1)The piriformis tubercle was taken as the posterior point (B) of the width (AB), while the tip of the ischial spine was taken as the anterior point (A) of the width. Maximum depth (OC) was determined between the base line (AB) and the deepest point (C) of the greater sciatic notch. OB was designated as the posterior segment of width of the greater sciatic notch. (Fig 2)

The following parameters of the greater sciatic notch were considered:

1. Maximal width: i.e. the distance between the tubercle of piriformis muscle and the tip of the Ischial spine (AB).
2. Maximal depth: i.e. perpendicular to the width (OC).
3. Posterior segment of the width: (OB).
4. Index I: depth (OC) x 100/width (AB).
5. Index II: posterior segment (OB) x 100/width (AB).

All measurements were made in millimeters.

RESULTS: A significant difference was noted both in maximum width (AB) as well as in maximum depth (OC) of the greater sciatic notches of male and female hip bones on the left side ($p<.05$); while the difference in the posterior segment of the width (OB) of the greater sciatic notches was significant on the right side ($p<.05$). (Table - 1)

Similarly, significant differences were found in the indices I and II of greater sciatic notches on the right and left sides, respectively ($p < .05$).

Parameter	Side	Mean(mm)		p-value
Max. Width(AB)	Right	Male =33.8	Female=45.0	>.05
	Left	Male =34.1	Female =43.3	<.05
Max. Depth(OC)	Right	Male =25.6	Female =24.7	>.05
	Left	Male =26.5	Female =24.2	<.05
Posterior segment of the width(OB)	Right	Male =28.9	Female =24.7	<.05
	Left	Male =28.0	Female =22.0	>.05
Index-I	Right	Male =74	Female =55	<.05
	Left	Male =78	Female =57	<.05
Index-II	Right	Male =85	Female =55	<.05
	Left	Male =82	Female =50	<.05

TABLE 1: Greater Sciatic Notches of right and left side of Males & Females compared.

DISCUSSION: Bruzek J. states that the precision of sex determination using the morphology of the greater sciatic notch to describe its shape corresponds directly to an estimation of the discriminatory power (varying by around 70%) of this trait. (5) Jovanovic S, Zivanovic S. and Lotric N tested the reliability of the greater sciatic notch in sex determination on deformed pelvis and concluded that pathological changes deforming the pelvis do not affect the greater sciatic notch in either sex. (12) The greater sciatic notch was found to be wider in females on the right side (Mean =45.0) and also on the left side (Mean= 43.3) as compared to males (Mean=33.8) on right side and (Mean= 34.1) on the left side. Similar observations have been made earlier. (7, 10, 17)

In the present study male notches (mean=25.6) were deeper on the right side as compared to females (mean=24.7) and on the left side also male notches (mean=26.5) were deeper in comparison to female notches (mean=24.2) which also supports the earlier findings of Derry De and Letterman G. (7, 17) However, even within the same general population, mean values may be significantly different in bones from different zones. Though width and depth of the greater sciatic notches are widely believed to be of great value in sex determination, the present metrical study has shown that they are in fact of utmost importance.

Index I, which depends on depth and width of the greater sciatic notch, was accordingly quite helpful in the sexing of hip bones. It was found to be significantly ($p < .05$) higher in males (male right index-I= 74, male left index-I = 78, female right index-I =55, female left index-I =57) which confirms earlier reports. (10, 11) The posterior segment of the width and Index II as well, are higher in males, which are well correlated with the findings of Davivongs V. (10) The fact that the parameters which depend on the width of the posterior segment and Index II are good sex discriminant factors; confirms the views of Jovanovic S., Zivanovic S. and Lotric N.; who stressed the importance of the upper segment of the greater sciatic notch in sex determination. (12)

The present study has shown that index-I is also highly significant in sex determination. The findings of the present study are well correlated with the facts established by Singh S. and Potturi B.R. who reported that the Posterior segment of the width and Index II successfully assigned sex to a high percentage of hip bones (95-97%). (13)

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Figure 1. The tri-flanged stainless steel caliper.

Figure 2. Parameters of greater sciatic notch.

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