

Determination of Sex through Hip Bone (greater sciatic notch) in Haryana Region



Medical Science

KEYWORDS : Greater sciatic notch, Hip bone, Sexual dimorphism, Vernier caliper.

Dr. Apoorva Tripathi

Department of Anatomy, Gold Field Institute of Medical Science and Research Ballabgarh, Faridabad -121004 Haryana

Dr. Supriti Bhatnagar

Department of Anatomy, Gold Field Institute of Medical Science and Research Ballabgarh, Faridabad -121004 Haryana

**Dr. Anuj Kumar
Deshwal**

Department of Anatomy, Gold Field Institute of Medical Science and Research Ballabgarh, Faridabad -121004 Haryana

ABSTRACT

The distinctive morphology of human skeleton and its clear sexual dimorphism make it of interests from anatomical, forensic, obstetrical, radiological and anthropological point of view. 100 known sex normal dry human hip bones obtained from the Department of Anatomy, Gold Field Institute of Medical Science and Research Faridabad Haryana were studied in the year of 2013. The posterior segment of Greater Sciatic Notch, Genoves' sciatic notch index and posterior angle are found to be significant by t test ($P < 0.001$). The posterior angle of greater sciatic notch was found to be highly significant for determination of sex of hip bone.

INTRODUCTION

The identification of sex from skeletal remains is of great medico-legal and anthropological importance. Hip bone is an ideal bone for sex determination because it not only reflects the general differences between the two sexes but also the special adaptation of female hip bone for child bearing. The anatomical land marks that do exist (such as the ischial spine) are fragile and easily damaged. Os coxae with sciatic notches well enough preserved to be measurable are thus likely to have intact pubic bones. In such cases, the presence of more reliable pubic sex indicators makes resorting to the sciatic notch unnecessary. Reliance on the visual assessment of sciatic notch morphology has the disadvantage of introducing a subjective element into sex determination.

The greater sciatic notch is especially valuable in such situations because it is highly sexually dimorphic, is resistant to damage, and thus can often be scored in poorly preserved skeletons. In the present investigation on sex determination, in addition to depth, width and various indices, the total and posterior angles of the greater sciatic notch were utilized as parameters (Bruzek, 2002¹, Jovanovic & Zivanovic, 1965², Singh S & Potturi B R, 1978³). Most osteologists visually evaluate these differences and integrate this subjective assessment of sciatic notch morphology into their sex determinations. Although many attempts have been made to describe sex differences in the sciatic notch using measurements (Schulter et al, 1983⁴, Letterman, 1941⁵, Byers S.N 2005⁶, Singh & Potturi, 1978), these metrical sexing techniques have not been widely adopted. One reason for this is the lack of easily located anatomical landmarks in the sciatic notch region. As a result, measurements that can be made consistently often fail to adequately describe the sex differences in sciatic notch shape. In the past, many workers have evolved various metrical parameters and indices for sexing of hip bone, Jovanovic & Zivanovic, Davivong, **Singh S & Potturi B R**. These authors who have studied this bone by osteometric method have paid attention either to features relating to its total size or to those of various components such as its inferior border, the symphyseal surface, the acetabulum, the obturator foramen and arcuate line. Greater sciatic notch in sex determination by Shamer Singh & Butachi Raju Potturi in 1977 show that the total angle was found to be significantly higher in female.

The present study establishes the impact of the 'sex factor' on the morphometry of the greater sciatic notch of hip bone (Jovanovic, Zivanovic & Lotric 1968⁷) pointed out that the upper part of the greater sciatic notch was a reliable marker in sex determination since it was not affected even in pathologically deformed conditions of the hip bones. The shape of the greater sciatic notch has also attracted attention (Davivongs, 1963⁸),

but no attempt has been made to measure its various angles.

MATERIAL AND METHODS

The material for the present study consist of 100 dry human hip bone of known sex. All these bones were fully ossified and free from any pathological or congenital defect. These bones obtained from the Department of Anatomy, Gold Field Institute of Medical Science and Research Faridabad Haryana. The measurement were done on intact parts of the normal bone. Bones showing wear and tear, fracture or any pathology were not considered. Each linear recording was taken to the nearest millimeter.

Measurement were taken by using:-

- Vernier caliper
- Measuring scale
- Protactor



Vernier caliper

The present study is undertaken in the following parameters of the greater sciatic notch :-

Maximal width: the distance between the tubercle of piriformis muscle and tip of the ischial spine (AB).



The fix point of vernier caliper is placed on piriformis tubercle & movable point of vernier caliper is placed on upper margin of ischial spine of hip bone and read the value.

(2) Maximal depth: perpendicular to the width (OC).



Placed the scale between the piriformis tubercle and tip of ischial spine and end of movable bar is placed on deepest point of sciatic notch and rest part of bar placed perpendicular to the scale.

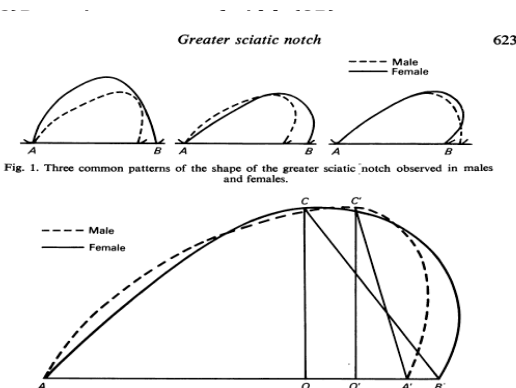


Fig. 1. Three common patterns of the shape of the greater sciatic notch observed in males and females.

Fig. 2. Diagrammatic representation of the widening of the greater sciatic notch in females, which has occurred mainly in the posterior segment of the notch resulting in greater posterior angle $\angle BCO$ and longer posterior segment OB in the females, both highly discriminant parameters.

(Interrupted curve shows greater sciatic notch of male and continuous curve shows greater sciatic notch in female)

The bar which determines the depth of sciatic notch that also divides the width of sciatic notch into anterior and posterior part. The posterior part (OB) is the distance between the bar and tip of ischial spine in the width of sciatic notch.

- (4) Index I: $\text{Depth}(OC) \times 100 / \text{width}(AB)$
- (5) Index II; $\text{Posterior segment}(OB) \times 100 / \text{width}(AB)$
- (6) Total angle; After construction on paper of the triangle ABC and depth OC from the above measurements $\angle ACB$ denoted the total angle.
- (7) Posterior angle; $\angle BCO$

Subjective variation was avoided by measuring each parameter three times by the investigator and mean of the reading obtained was recorded.

Statistical Analysis:-

General descriptive statistic for the for greater sciatic notch measurement were carried out by using mean, standard deviation. The formula used for their calculation is as follows:

Mean = $\sum X / n$

Where, $\sum X$ = sum of total observations,

n = total no of observations

Standard Deviation(s) =
$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}$$

RESULT

We measured 100 hip bone. The data was tabulated and statistical analysis was done to take out the mean and standard deviation of various diameter of the sciatic notch.

MEAN AND S.D. CALCULATION:-

VARIABLE	SEX	SIDE	NUMBER	MEAN	STANDARD DEVIATION	P-VALUE
(1) BREADTH (AB) M.M.	MALE	LEFT	30	45.20	3.60	0.001
		RIGHT	19	44.30	3.20	
	FEMALE	LEFT	36	47.40	4.38	
		RIGHT	15	48.27	5.16	
(2) POSTERIOR SEGMENT (OB) M.M.	MALE	LEFT	30	6.38	1.75	0.001
		RIGHT	19	6.06	1.63	
	FEMALE	LEFT	36	15.57	3.40	
		RIGHT	15	16.39	3.45	
(3) DEPTH (OC) M.M.	MALE	LEFT	30	25.62	3.50	0.001
		RIGHT	19	25.93	3.80	
	FEMALE	LEFT	36	24.97	3.23	
		RIGHT	15	25.86	4.40	
(4) INDEX-I	MALE	LEFT	30	64.48	12.17	0.001
		RIGHT	19	65.12	8.24	
	FEMALE	LEFT	36	53.03	7.28	
		RIGHT	15	53.69	8.90	
(5) INDEX-II	MALE	LEFT	30	15.00	4.23	0.001
		RIGHT	19	14.61	3.41	
	FEMALE	LEFT	36	32.81	5.93	
		RIGHT	15	33.70	6.76	
(6) TOTAL ANGLE, $\angle ACB$	MALE	LEFT	30	66.15	6.54	0.001
		RIGHT	19	65.31	7.53	
	FEMALE	LEFT	36	83.35	7.59	
		RIGHT	15	82.76	8.41	
(7) POSTERIOR ANGLE, $\angle BCO$	MALE	LEFT	30	13.34	3.23	0.001
		RIGHT	19	12.78	3.09	
	FEMALE	LEFT	36	31.88	5.51	
		RIGHT	15	32.42	5.49	

DISCUSSION

In present study shows that the greater sciatic notch was found to be significantly wider in females than in males, irrespective of the side of the bone. Similar observations have been made earlier (Singh and potturi 1978, Verneau R, Bassin L1875⁹, Thomson 1899¹⁰, Derry 1923¹¹, Letterman 1941, Davivongs 1963). Male notches were found to be deeper, though not significantly so, which also supports the earlier findings of Verneau (1875), Derry (1923) and Letterman (1941). However, Davivongs (1963) found that female sciatic notches were deeper as well as wider in Australian origins. This deviation can be regarded as a racial characteristic (Krogman W M, Iscan M Y 1986¹²). Though width and depth of the greater sciatic notch are widely believed to be of great value in sex determination, the present metrical study has shown that they are in fact of little value. Index I, which depends on depth and width of the greater sciatic notch, was accordingly not much help in the sexing of hip bones. It was found to be higher in males. The length of the posterior segment, Index II and the posterior angle was found to be very useful in sex determination significantly lower (P < 0.001) in males. The mean length of the posterior segment, and Index II (which depends on both widths and length of the posterior segment) was 2-2.5 times higher in females. The posterior angle of the greater sciatic notch, a new measurement not used by earlier workers, was found to be the most useful parameter for sex determination.

Its mean values for females were more than 2-5 times those of males, and showed minimal overlap in their ranges, resulting in correct identification of 92-100 % of all female bones. The posterior angle of the greater sciatic notch, a new measurement not used by earlier workers, was found to be the most useful parameter for sex determination. Its mean values for females were more than 2-5 times those of males, and showed minimal overlap in their ranges, resulting in correct identification of 92-100 % of all female bones.

In present study the range of Breadth for male and female are 2.7-5.3 and 3.2-5.3 respectively and breadth mean are 3.85 ± 0.459 and $4.27 \pm .481$ respectively for male and female. So mean value of female is more than male which matches the study of Singh and Potturi. Similar observations have been made earlier by Verneau, Thomson, Derry. Mean values in my study is almost matches the Singh and Potturi study.

CONCLUSION

The identification of sex from skeletal remains is of great medico-legal and anthropological importance. Hip bone is an ideal

bone for sex determination because it not only reflects the general differences between the two sexes but also the special adaptation of female hip bone for child bearing. The present study establishes the impact of the 'sex factor' on the morphometry of the greater sciatic notch of hip bone.

The upper part of the greater sciatic notch was a reliable marker in sex determination since it was not affected even in pathologically deformed conditions of the hip bones. The measurements depends also on the population itself: "Estimates of sex therefore can be difficult if the observer is not familiar with the overall pattern of variability within the population from which the sample is drawn.

This data will be useful for the Anatomist, Surgical treatment of hip bone, Fracture of hip bone, Anthropoplasty and diagnosing congenital hip dysplasia, Anthropologists and experts in field of Forensic medicine.

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