



Measurement of Various Parameters of Greater Sciatic Notch of Pelvis

KEYWORDS

Greater sciatic notch, hip bone, parturition

Dr. Gautam Kumar Singh

M.S., M.B.B.S., Masters in Anatomy, Assistant Professor in Anatomy, Netaji Subhash Chandra Bose Medical College, Jabalpur.

ABSTRACT *The Greater sciatic notch of pelvis is important for determination of sex after death for anatomists and forensic experts in medico-legal cases. The pelvis bone which is made by the two hip bones articulated with sacrum. The dimension of greater sciatic notches of human pelvis are much important for especially female during parturition, larger in dimension much easy for delivery of baby. Moreover, in the pathological deformed pelvis, the shape and dimensions of the great sciatic notch are of practical significance in obstetrics and serve as an important indicator of the pelvic capacity. This study tells about dimensions, depth and index of greater sciatic notch, after measurement of many hip bone show female pelvis has wider than male pelvis. It may be due to long term adaptation developed for delivery of baby.*

Introduction-

The importance of the pelvic girdle in anthropometry is well accepted, for in addition to the sex differences between greater sciatic notches are valuable, because it is highly sexually dimorphic, is resistant to damage, and thus can often be scored in poorly preserved skeletons. Female sciatic notches are wider than those of the males, and there are also shape differences between the sexes. In males the greater sciatic notch tends to be narrow and U-shaped. In females it is comparatively open, with a lower width-to-depth ratio (Bruzek, 2002; Glanville, 1967; Jovanovic and Zivanovic, 1965; Lazorthes and Lhez, 1940; Singh and Potturi, 1978). For sex determination, in addition to depth, width and various indices, the total and posterior angles of the greater sciatic notch were utilized as parameters, and demarking points for each parameter were worked out on the lines of Jit & Singh (1966), i.e. instead of using the limiting points of the actual range of each parameter for identification of sex, fiducial limits have been calculated by adding and subtracting three standard deviations (S.D.) to and from the mean value of each measurement. Since such a calculated range (mean \pm 3 x S.D.) covers nearly all the cases from any given region, these demarking points identify sex with virtually 100 % accuracy. Using the three criteria, Phenice was able to estimate the sex with an accuracy of 96%. The anatomical landmarks on lower end of sciatic notch that do exist (such as the ischial spine) are fragile and easily damaged. Osteologists vary widely in their experience with known-sex collections, and this undoubtedly influences the amount of weight they give in their sex determinations to differences in sciatic notch shape. Such inconsistencies make demographic comparisons of collections studied by different investigators difficult. Using an ordinal scale to describe sciatic notch sex differences can reduce this subjectivity problem. Verneau was the first (1875) to notice the sexual variations of the great sciatic notch on the posterior edge of the iliac-bones. He said that in the male the great sciatic notch is narrower than in the female, and that in the female it is not so deep. After Verneau's remarks the sexual variations of the great sciatic notch had drawn the attention of a large number of authors Genoves (1921), Lazorthes & Lhez (1939), Letterman

(1942), Heynes (1947), Jovanovic and Zivanovic (1963), who in their reports showed the influence of sex on the great sciatic notch and its dimensions, and the importance of the notch in sex differentiation of pelvises. Main difficulties for the proper measuring of greater sciatic notch is the great variabilities or sometimes the absolute absence of certain morphological formations and points (landmarks) necessary for taking dimension of notch. The sciatic spine, which is the lower point of the great sciatic notch, has different morphological forms. Lazorthes and Lhez (1939) described 3 morphological types of spines which in most cases make the measuring very difficult or even impossible. The spine is very often absent in osteological material or it is more or less broken. Even in very good osteological collections the spine is often spoiled or completely destroyed. Because of that reason Genoves (1921) took his measurements from the base instead of from the tip of the sciatic spine. But Jovanovic and Zivanovic took the upper point of greater sciatic notch as usual but the lower point is different from other previous works. Both researchers took the lower point at the most medial part inside the ridge of the sciatic tubercle which is present on the ischial tuberosity. The inner part of the sciatic tubercle forms a sharp prominent ridge and the most medial point of the ridge is varies often in male than in female. Jovanovic, Zivanovic & Lotric (1968) 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, 1963), but no attempt has been made to measure its various angles. Indices and angles of the greater sciatic notch are known to be highly sexually dimorphic. Consequently, they have been considered to be reliable sex discriminators (Caldwell and Moloy, 1932; Lazorthes and Lhez, 1939; Letterman, 1941; Genovés, 1959; Jovanovic and Zivanovic, 1965; Jovanovic et al., 1968; Singh and Potturi, 1978; Taylor and DiBennardo, 1984; Novotný, 1986; Patriquin et al., 2005), although they are not the best. The most efficient morphological discriminators of sex relate to the pubic bone (MacLaughlin and Bruce, 1986; Walker, 2005). The puboischial index, based on maximum lengths of the is-

chium and pubis, measured from their acetabular junction, produced accuracy values of 83.7% and 100.0% for American males and females. When this was correlated with the angle of the sciatic notch, it was claimed that the sex of 98% of pelves could be deduced (Washburn, 1949).The greater sciatic notch and acetabulum are located in the central portion of the hip bone and, consequently, are better preserved. Since width and depth of the notch, per se, have been found valueless in determining sex(Williams et al., 1989), width-to-depth indices and angles have been defined differently (Lazorthes and Lhez, 1939;Martin and Saller, 1957; Singh and Potturi, 1978). These variables are affected substantially by the greatest width of the notch, which sometimes cannot be measured. The main difficulty encountered in the proper measurement of the notch is the great morphological variability of the area, and also the absence of certain morphological structures and points necessary for defining dimensions of the notch; for instance the ischial spine, posterior inferior iliac spine, and tubercle of the piriformis; which can be variably expressed and/or ill-defined also (Lazorthes and Lhez, 1939; Jovanovic and Zivanovic, 1965). For general purpose, visual features can be relied on for sexing the pelvis (Stewart, 1954). Issac B has concentrated on different measurements at the posterior border of hip bones. He has presented the result of his study on 42 human hip bones and draws some important conclusions which help in determination of sex and side of hip bones. Slavoljub Jovanovic and Srboljub Zivanovic have studied previously on the greater sciatic notch for sex determination which given good results in this respect. we concluded the study of morphology of human hip bones is the important bones for anatomists, anthropologists, forensic experts and archeological persons and it has many features which differentiate between sex, useful for parturition, This creates more interest to specialist in this field and due to this reason more work has been done on this bone and its different characters to give definite results.

Method-

1.The length of the posterior border forming the greater sciatic notch measured with thread from posterior inferior iliac spine and the base of spine which is determined by a thread which cuts on the greater sciatic notch near the ischial spine by joining the posterior inferior iliac spine to the point on the lesser sciatic notch(which was identified by the a horizontal line drawn from the upper part of ischial tuberosity and cuts at the lesser sciatic notch).(S1)

2.The distance between posterior inferior iliac spine and the base of spine(determined by same as in 1st parameter) which is measured by calliper.(S2)

3.the distance between posterior superior iliac spine to the sciatic tubercle(a most medial elevation present on the ischial tuberosity).(AB)A for posterior superior iliac spine & B for sciatic tubercle.

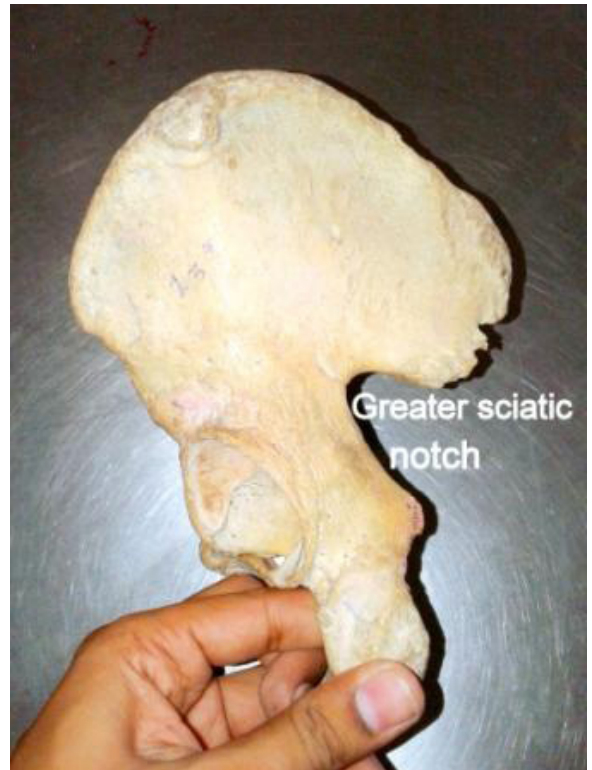
4.The depth of the greater sciatic notch is measured between the deepest point of the greater sciatic notch and the perpendicular line that cuts the width AB line .(CD)C for point where depth line cuts AB line and D for deepest point of greater sciatic notch.

5.The distance between posterior superior iliac spine and the point where the depth line cuts the AB line.(AC) A & C point is describe in above parameters.

6.The index of upper part of greater sciatic notch obtained by AC multiplied by 100 and divided by CD(AC X 100/ CD).

Materiel -

- (1) Good numbers of human hip bone with approximately same temperature and fix humidity to avoid any bias due to environmental changes. The male and female bones were identified and kept in groups of right and left bones for each sex separately.
- (2) Scale
- (3) sliding calliper
- (4) Thread
- (5) Measure tape
- (6) Plasticine



The human hip bone showing greater sciatic notch

Observation-

In this study 258 hip bones were taken, Out of this 142 were male and 116 were female. Right and left bones of both the sexes were separated,Thus in male sex there were 66 bones of right side and 76 of left side. In female 62 of right side and 54 of left side.

Statistical value of different parameters-

Sex	Side	S1	S2	AB	CD	AC	
Male	Right	N	66	66	66	66	
		Mean	8.57	4.30	11.42	3.90	4.25
	Left	N	76	76	76	76	76
		Mean	8.47	4.15	11.27	3.91	4.09
	Total	N	142	142	142	142	142
		Mean	8.52	4.22	11.34	3.90	4.17

Female	Right	N	62	62	62	62	62
		Mean	8.00	4.35	11.10	3.60	4.10
	Left	N	54	54	54	54	54
		Mean	8.09	4.37	10.86	3.64	3.97
	Total	N	116	116	116	116	116
		Mean	8.04	4.36	10.99	3.61	4.04
Total	Right	N	128	128	128	128	128
		Mean	8.29	4.33	11.27	3.75	4.18
	Left	N	130	130	130	130	130
		Mean	8.31	4.24	11.10	3.79	4.04
	Total	N	258	258	258	258	258
		Mean	8.30	4.28	11.18	3.77	4.10

value in cm.

Results & Summary-

The hip bones belonging to the cadavers from Jabalpur and surrounding area was taken for study .Following inference is derived:

- 258 Hip bone have been studied, in which 142 Males(66 right and 76 left) and 116 Females (62 right and 54 left).
- The average values of S1 of right side and left of hip bone of male are greater than female.
- The average values of S2 of right side and left of male are lesser than female.
- The total value (right and left of same sex) of S1 of male is greater than female and value is statistically significant.
- The total value of S2 of female is greater than male but satistically not significant.
- The average of right side and left of male of AB,CD,AC was greater than female.
- The total average value of AB, CD, AC of male was greater than female.
- The index of male was less than female.

REFERENCE

- Jovanovic, S; & Zivanovic, S. (1965): The establishment of the sex by the great sciatic notch. Acta Anatomica. 61: pp.101-107. | 2.Jovanovic, S; Zivanovic, S. & Lotric, N. (1973): A study of sex determined characteristics of the hip bone in pathologically deformed pelves using the method of Sauter and Privat. Acta Anatomica. 84: pp. 62-70 | 3.Philip L. Walker(2003):Greater sciatic notch morphology: Sex, Age, and population differences. American journal of Physical Anthropology 127:385-391(2005). | 4.Sharma and M.Lal(1999):Sex determination of human hip bones from genoves sciatic notch index. JFMT vol.16, No 1, jan to june, 1999. | 5.T.W. PHENICE (1967):A newly developed visual method of sexing the os pubis.American journal of physical anthropology,30:297-302. | 6.Ubelaker DH, Volk CG(2000):A test of the Phenice method for the estimation of sex.J Forensic science 2002;47(1):19-20. |