MORPHOMETRY OF GREATER SCIATIC NOTCH AS A TOOL FOR GENDER DETERMINATION

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Abstract: The hip bone is considered as an ideal bone for sex determination as it provides the highest accuracy levels.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 unknown sex normal dry human hip bones obtained from Medical Colleges of Meenakshi University & Southern Medical University, China. Various measurements of the greater sciatic notch, e.g. width, depth and length of the posterior segment (of width) were measured, and indices I and II calculated, in 100 adult hip bones (60 males and 40 females). Total and posterior angles were measured after construction of a triangle from the above measurements in each case. Demarking points for sexing of hip bones were calculated for the above parameters.

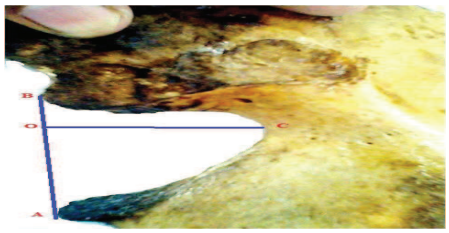
Keywords : Greater Sciatic Notch, Hip Bone, Sexual Dimorphism.

Introduction: The hip bone is a large, flattened, irregularly shaped bone, constricted in the center and expanded above and below. It meets its fellow on the opposite side in the middle line in front, and together they form the sides and anterior wall of the pelvic cavity. It consists of three parts, the ilium, ischium, and pubis, which are distinct from each other in the young subject, but are fused in the adult; the union of the three parts takes place in and around a large cup-shaped articular cavity, the acetabulum, which is situated near the middle of the outer surface of the bone. The ilium, so-called because it supports the flank, is the superior broad and expanded portion which extends upward from the acetabulum. The ischium is the lowest and strongest portion of the bone; it proceeds downward from the acetabulum, expands into a large tuberosity, and then, curving forward, forms, with the pubis, a large aperture, the obturator foramen. The pubis extends medialward and downward from the acetabulum and articulates in the middle line with the bone of the opposite side: it forms the front of the pelvis and supports the external organs of generation.The Ilium (*os ilii*).—The ilium is divisible into two parts, the body and the ala; the separation is indicated on the internal surface by a curved line, the arcuate line, and on the external surface by the margin of the acetabulum. The Body (*corpus oss. ilii*).—The body enters into the formation of the acetabulum, of which it forms rather less than two-fifths. Its external surface is partly articular, partly non-articular; the articular segment forms part of the lunate surface of the acetabulum, the non-articular portion contributes to the acetabular fossa. The internal surface of the body is part of the wall of the lesser pelvis and gives origin to some fibers of the Obturator internus. Below, it is continuous with the pelvic surfaces of the ischium and pubis, only a faint line indicating the place of union. Greater Sciatic notch on the posterior border of the hip bone between the posterior inferior iliac spine and the spine of the ischium. Sexual Dimorphism an 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.

Aim & Objectives : Gendering the Hip bones based on anatomical features by Classifying the Hip bones by grading according to various shapes of Greater sciatic notch, Calculating the total angle of greater sciatic notch by constructing a triangle with a Sample Size of 100 Dry Individual Hip Bones with Inclusion criteria as The following adult human hip bones were taken for the study which were Fully ossified bones, unbroken bones and not having any deformities with intact greater sciatic notch. Following conditions were excluded from the study with deformed bones, malformed bones and bones with congenital anomalies, broken Bones.

Materials : Hip bones, Vernier calipers - To measure, the width, depth, Posterior segment of greater sciatic notch, Inch scale, other stationeries.

Methods : By viewing the shape of greater sciatic notch the hip bone were graded into Grade- 1, Grade-2,Grade-3.Grade-4,Grade-5.And with Vernier caliper the width, depth ,posterior segment, Index I & II was measured and a triangle was constructed and total angle of greater sciatic notch was calculated.

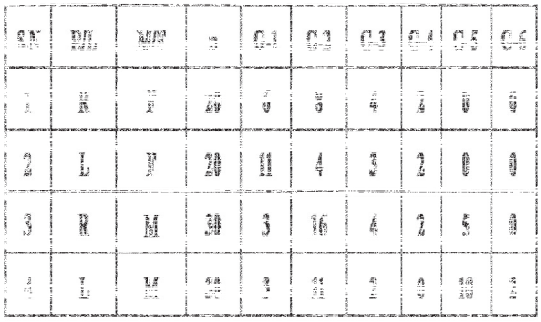


A=Ischial spine, B=Pyriform tubercle, Width= AB, Depth = OC, Posterior segment =OB, Posterior angle =BCO, Total angle= ACB.

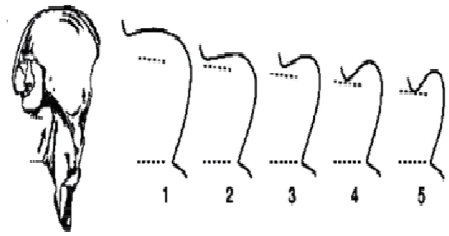
Observations :

Gendering the Hip Bones According to Anatomical Features :

S.NO	Land Mark	MALE	FEMALE
1	Obturator Foramen	Large ,Oval	Small ,Triangular
2	Acetabulum	Larger	Smaller
3	Pubic crest	Shorter	Longer
4	Iliac Fossa	Deeper	
5	Curvature of Iliac crest	More	Less
6	Greater Sciatic Notch	Narrower	Wider

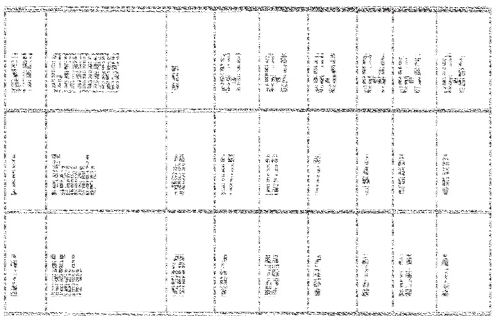


GRADING THE MORPHOLOGY OF GREATER SCIATIC NOTCH



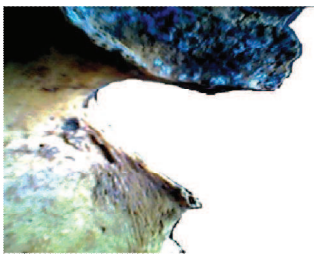
GRADING THE MORPHOLOGY OF GREATER SCIATIC NOTCH ON RIGHT AND LEFT SIDE

GRADING THE MORPHOLOGY OF GREATER SCIATIC NOTCH ON BOTH GENDERS



GRADING THE GREATER SCIATIC NOTCH:

GRADE-1



GRADE-2

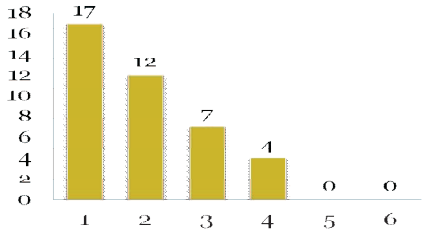
GRADE-3

GRADE-4

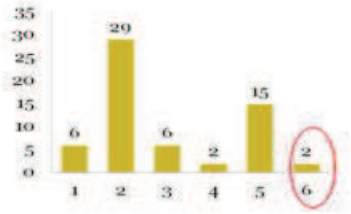
GRADE-5

GRADE-6

GRADING THE GREATER SCIATIC NOTCH GRAPHICALLY



FEMALE



MALE

Discussion : Kalsey, G K, R K S, K S-etal & Dr. Shaival Shah etal - The distinctive morphology and sexual dimorphism of the human hip bone makes it of interest from the anatomical, anthropological,obstetrical, radiological and forensic points of view. The shape of the greater sciatic notch has attracted great attention in the past. In the current investigation, an attempt has been made to find the baseline data of various parameters pertaining to the greater sciatic notch.

Jane E.Buikstra, Douglas H.Ubelaker & Rajangam S., Jankiram S. and Thomas I. M -Developed standards for scoring sex differences in greater sciatic notch which he graded into Grade I,II,III.IV,V. While holding the bone , move it from diagram to diagram to decide the closest match as picture shown above for grading.

In our study we observed shape of greater sciatic notch and graded as given above but as few bones did not match to the above given grades and we grouped them into Grade VI.

Grade VI was observed only in male hip bones (gender determined anatomically).

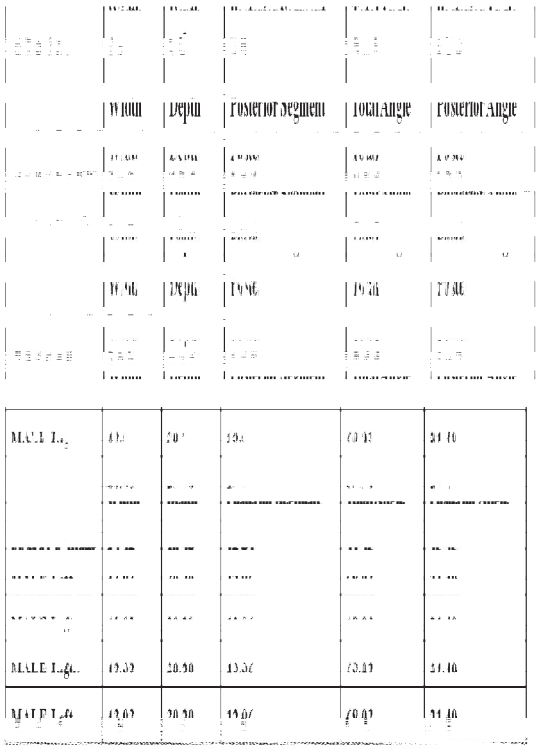
Liknur Ari, Kelly M.A & MacLaughlin S.M. and Bruce M.F - Measurements were taken with the help of a Vernier caliper . The pyriformis tubercle was taken as the posterior point (B) of the width (AB), while the tip of the ischial spine was taken as the anterior point (A) of the width . maximum depth (OC) was determined between the base line (AB) and the deepest point (C) of the sciatic notch. OB was designated as the posterior segment.

Philip L. Walker & Krogman W.M - Study graded grade-I for females and grade III for males. But in our study males with grade I-VI (mostly II,V) observed and females with grade I-IV (mostly I,II) observed.

Total angle of greater sciatic notch was found to be significantly higher in females compared to males. In males with an average of **71°** while in females with an average of **74°** observed.

Total angle $< 71^{\circ}$ was determined as male and $> 74^{\circ}$ determined as female .

In medico legal cases 100% accuracy of gender is demanded so range is calculated by adding 3 x S.D to the mean value.



Jovanovic et-al & Singh S. and Potturi B.R – parameters depending on posterior segment and Index-II , posterior angle turned out to be good sex determinant . In our study Index-I and Total angle found to be good sex determinant. Shah - The posterior angle of greater sciatic notch was found to be highly significant for determination of sex of hip bone.

Singh S. and Potturi B.R -Total angle was found to be more significant and our study also correlates.

Conclusion : Visual grading of sex differences in greater sciatic notch was determined with Males as grade I-VI (mostly II,V) were observed and grade I-IV were observed in females (mostly I,II).

Grade VI was found only in males and Total angle of greater sciatic notch <71° male and >74° female. As the total angle and Index-I were found out to be a good sex determinant.

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