Fixing the Deepest Point on Greater Sciatic Notch for Measuring or Calculating Maximum Depth of Greater Sciatic Notch

Uday Pal Singh[1] , D Vijaya Raghavendra[2,]

[1] *Professor and Head,[2] Assistant Professor, Dept of Forensic Medicine, Mamata Medical College, Khammam*

Abstract

Background: Aim of the present study is to fix the deepest point in the curvature of greater sciatic notch for measuring or calculating maximum depth.

Material and Method: Hip bones of each sex (30 male and 30 female) were divided in two groups consisting of 15 bones in each group. For first group the farthest point from the maximum width of greater sciatic notch was taken as the deepest point. For the second group the point of first touch from arcuate line onto the greater sciatic notch curvature was taken as the deepest point. Maximum depth of greater sciatic notch was calculated from that point for both groups. The maximum depth of greater sciatic notch for each sex were checked for any statistical difference between the two groups by using two tailed t-test to calculate the *p*-value.

Result: *p*-value, for maximum depth of greater sciatic notch between group 1 and 2 was found to be 0.149 for male hip bones and 0.8883 for female hip bones. Statistically there was no significant difference in the maximum depth of greater sciatic notch calculated by fixing the deepest point either from maximum width of greater sciatic notch or from arcuate line.

Conclusion: We can use the point of first touch from arcuate line to greater sciatic notch as the point of maximum depth of greater sciatic notch.

Key words: *Hip bone, gender, maximum depth of greater sciatic notch, Arcuate line.*

Introduction

Determination of gender of unknown skeleton is a routine work for those who are involved in medico-legal work. Sexing of unknown skeletal material depends on the relative completeness of the skeleton. Percentage of accuracy for adult material is 100 percent from entire skeleton; 95 percent from pelvis alone; 90 percent from skull alone; 98 percent from pelvis plus skull; 80 -90 percent from long bones alone; 90-95 percent from long bones plus skull; 95 percent or more from long bones plus pelvis.[1] The female pelvis, on account of its development for child bearing, has always been the principal and most reliable indicator of sex.[2] The bone which is most important in determining the gender of skeletal remains is hip bone. As a single criterion to determine the sex greater sciatic notch has an accuracy of 75% (Washburn).[3] Different parameters used in determining the gender are maximum width of the greater sciatic notch, maximum depth of greater sciatic notch, greater sciatic notch index,[4] index I of greater sciatic notch, index II of greater sciatic notch[5,6,7,8] and Genovos index.[9] But for the maximum width of greater sciatic notch all the remaining parameters need the maximum depth of greater sciatic notch for calculations. In other words, the value of maximum

Corresponding Author:
Dr D Vijaya Raghavendra,
Assistant Professor,
Department of Forensic Medicine
Mamata Medical College, Khammam-507002
Email: dr.dvrplus@gmail.com

depth of greater sciatic notch is a must when we study the greater sciatic notch. Various scholars used different methods to measure the maximum depth of the greater sciatic notch. In all the studies, the deepest point on the curvature of greater sciatic notch was assessed and then measured the perpendicular distance from that point to the maximum width of the greater sciatic notch.[10,11,12] But the exact location of deepest point on the greater sciatic notch curvature is not found in texts. It is true that the perpendicular maximum distance from the width of the greater sciatic notch to the notch curvature is to be considered as the maximum depth, hence technically if we keep on drawing parallel lines from the maximum width of greater sciatic notch the point of last touch on greater sciatic notch is to be considered as the point farthest from the width (photograph 1) and hence the deepest point on the curvature of greater sciatic notch. The problem with this method is the deepest point on greater sciatic notch depends on the points taken for measurement of maximum width of greater sciatic notch. Keeping that in mind fixation of the point of maximum depth of greater sciatic notch is attempted independent of the points taken for measuring width of greater sciatic notch. If we draw parallel lines from arcuate line towards greater sciatic notch the point of first touch on greater sciatic notch can be the deepest point (Photograph 2,3). The current study is taken with the aim to check whether the point of first touch from arcuate line is the deepest point on the greater sciatic notch or not.

Aims and Objectives

The present study is done on 30 male and 30 female dried adult hip bones to fix the deepest point in greater sciatic notch curvature. Hypothetically it is assumed that point of first touch of the line parallel to the arcuate line of hip bone and the curvature of greater sciatic notch is the point of maximum depth of greater sciatic notch. The hypothetically assumed point is checked statistically whether it corresponds to the point of maximum depth of greater sciatic notch or not.

Materials and Method

Materials used for the present study were: Dried adult hip bones of known sex (30 male and 30 female), Vernier calliper, CD marker, OHP sheet with printed parallel lines on it and series of parallel lined paper. Statistical analysis is done using Micro soft office excel 2016.

Inclusion criteria: Morphologically intact dry adult hip bones of known sex.

Exclusion criteria: Broken, incomplete, unossified hip bone and the hip bones of unknown sex.

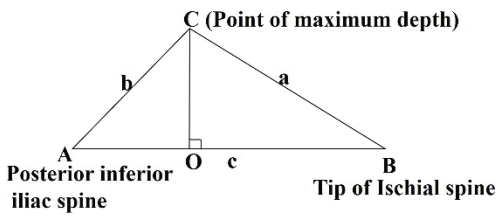
Sixty morphologically intact dried adult hip bones of known sex (30 male and 30 female) were collected from department of forensic medicine and anatomy of Mamata medical college, Khammam. The hip bones were divided in 2 groups consisting of 15 male hip bones and 15 female hip bones in each group. Two points were marked on each hip bone

1. Point A: Posterior inferior iliac spine,
2. Point B: Tip of ischial spine.

The maximum depth of greater sciatic notch was marked as point "C". For group 1 the point of last touch from width of greater sciatic notch on the curvature of greater sciatic notch is considered as the deepest point. This was done by using a paper with parallel lines and keeping the hip bone over the paper and then marking the point of last touch as point "C" (photograph 4). In the second group the point of first touch on the curvature of greater sciatic notch from the arcuate line is marked as the point of maximum depth (the nearest point on the curvature of greater sciatic notch from arcuate line), using the OHP sheet with printed parallel lines (photograph.5).

Using Vernier callipers following measurements were taken :

AB (the width of greater sciatic notch), BC and AC (as shown in photographs 6,7 and 8). The perpendicular distance from point C to AB touches the line AB at point "O". The distance OB is the maximum depth of greater sciatic notch which is calculated as OC = 2(area of triangle ABC)/AB.



The maximum depth of greater sciatic notch of group 1 is compared with that of group 2 for the same gender using p-value.

Observation and result

Table 1 is showing the depth of greater sciatic notch in males. The mean depth of greater sciatic notch was found to be 33.28 millimetres with standard deviation of 2.35 and a range of 7.36 in group 1. The mean depth of greater sciatic notch was 34.46 with standard deviation of 1.98 and a range of 6.8 in group 2. The *p*-value of 0.149(as calculated by 2 tailed t test) suggested that the difference between the depth of greater sciatic notch of males of the two groups were statistically insignificant.

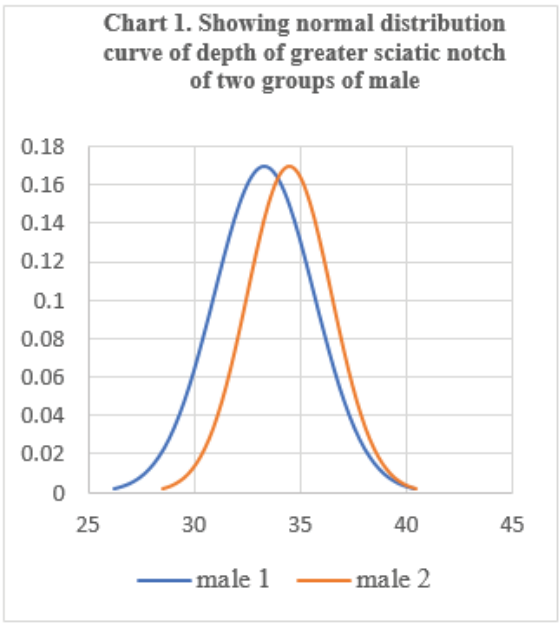
Table 2 is showing the depth of greater sciatic notch in females. The mean depth of greater sciatic notch was found to be 31.14 with standard deviation of 2.71 and arrange of 9.6 in group 1. The mean depth of greater sciatic notch was 31.27 with standard deviation of 2.16 and range of 7.63 in group 2. The *p*-value of 0.8883 (as calculated by 2 tailed t test) suggested that the difference between the depth of greater sciatic notch of females of the two groups were statistically insignificant.

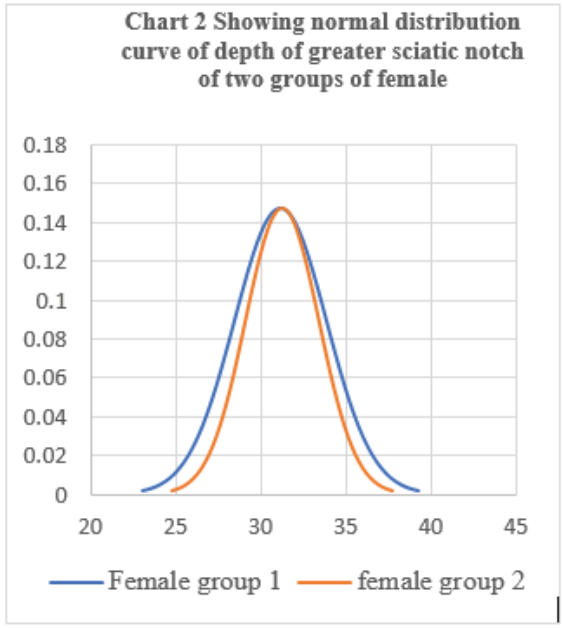
Table 1. Depth of Greater sciatic notch (Male)

	Male group 1 (n=15)	**male group 2 (n=15)**
Mean in millimetres	33.28	34.46
Range	7.36	6.8
Standard error of mean	0.61	0.51
Standard deviation	2.35	1.98
2 tailed p-value	0.149 (No significant difference)	

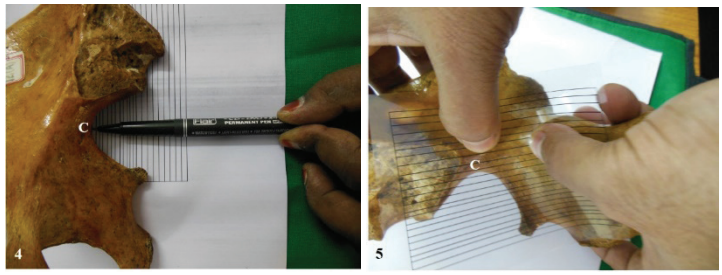
Table 2. Depth of Greater sciatic notch (Female)

	Female group 1 (n=15)	**Female group 2 (n=15)**
Mean in millimetres	31.14	31.27
range	9.6	7.63
Standard error of mean	0.7	0.56
Standard deviation	2.71	2.16
2 tailed p-value	0.8883 (no significant difference)	





Photograph 1. Showing the deepest point on greater sciatic notch ie Point of last touch from the width of Greater sciatic notch; 2. Showing point of first touch on greater sciatic notch curvature from arcuate line and 3. Showing that both these points may be the same.



Photograph 4. Showing marking of deepest point using point of last touch from width; 5. Showing way to get point of first touch from arcuate line.

Photograph 6. Showing measurement of width of greater sciatic notch; 7. Showing measurement of the distance between B(tip of ischial spine) and C(deepest point in greater sciatic notch); 8. Showing measurement of AC (distance between posterior inferior iliac spine and deepest point in greater sciatic notch).

Discussion

The maximum depth of greater sciatic notch depends on the points taken for the measurement of width of greater sciatic notch. The width of greater sciatic notch is measured as the distance between posterior inferior iliac spine to tip of ischial spine[10] which seems to be correct by seeing the morphology of the bone. The width of greater sciatic notch is measured from pyriformis tubercle to ischial spine;[8,11] Pyriformis tubercle to tip of ischial spine;[5,9,13] Posterior inferior iliac spine to base of ischial spine.[12] This makes the deepest point on greater sciatic notch to be marked differently for the same hip bone, as the deepest point on the greater sciatic notch varies with the variation in selection of points for measurement of width of the greater sciatic notch. We must be in a position to mark the maximum depth on the curvature of greater sciatic notch independent of the points taken for width of the greater sciatic notch. The structure of the hip bone that is less damaged is the mid part of the hip bone. The arcuate line, which is near to the greater sciatic notch curvature and a fixed bony landmark, found in all hip bone was taken into consideration to fix the deepest point of greater sciatic notch. The calculated depth of greater sciatic notch of the two groups of same sex in our study has not shown any statistically significant differences. Hence we can use either point of first touch from arcuate line or point of last touch from the width of greater sciatic notch as the deepest point on the curvature of greater sciatic notch.

Conclusion

Determination of deepest point on the curvature of the greater sciatic notch makes the measurement of maximum depth of the greater sciatic notch easier, more convenient and objective. As forensic experts most of the time we do receive broken hip bones, in such situation point of maximum depth of the greater sciatic notch can be fixed from arcuate line with ease.

Acknowledgement: I express my sincere thanks to Dr Vinay G. Professor and Head of Anatomy Department and Dr Nithesh Kumar K. Professor of community medicine, Mamata medical college, Khammam, for helping in procuring the hip bones for the study and in statistical analysis.

Conflict of Interest: None.

Ethical Clearance - Taken from Communication of Decision of the Institutional Ethics Committee (IEC)/ Institutional Review Board

Source of Funding - Nil

References

1. Krogman W.M. and Iscan M.Y. The Human Skeleton in Forensic Medicine, Charles C. Thomas, Springfield, Ilinois, U.S.A,2nd edition, 1986:259.
2. Keith Mant A. Taylor's Principles and practice of Medical Jurisprudence, BI Churchill Livingstone, New Delhi- 1994 1st Indian Edition, P.no163.
3. Knight B. HWV Cox Medical Jurisprudence and Toxicology, The law book company(P) Ltd, Allahabad-1987, 5th edition.
4. Aggarwal A. Forensic Medicine and Toxicology for MBBS, Avichal publishing company, Sirmour(HP)-2016,1st edition,P.no51.
5. Singh S, Potturi BR. Greater Sciatic Notch in Sex Determination, J. anat 1978;125,3:619-624.
6. Okoseimiema SC, Udoaka AI, Radiologic Study of Indices in the Greater Sciatic Notch in South Nigerian Population. Current Research Journal of Biological Sciences 2013; 5(6): 248-251.
7. Jain SK, Choudhary AK. Sexual dimorphism in greater sciatic notch - a morphometric study. Journal of Evolution of Medical and Dental Sciences 2013; 40(2):7653-7657.
8. Dnyanesh S, Dnyanesh DK, Phaniraj S, Mallikarjun M, Vijayashri BH, Amgain K. Study of Greater Sciatic Notch in Sex Determination of Hip Bone by Metric Method. IOSR Journal of Dental and Medical Sciences 2013; 10(4):18-23.
9. Siddapur KR, Siddapur GK. Pelvic bone indices as effective parameters of sex determination in skeletal remains: a cross-sectional study. International Journal of Research in Medical Sciences 2014 ; 2 (4):1526-1529.
10. Gohil D, Rathod SP, Adhvaryu M, Chauhan A, Joshi H. A study of greater sciatic notch as an indicator of sex determination of adult human hip bone. Journal of Research in Medical and Dental Science 2013;1(2):52-55.
11. Siamak S, Maryam A, Kamran A, Soheila G. Evaluation of Greater Sciatic Notch Parameters in Sex Determination of Hip Bone by Three-Dimensional CT Images.
12. Singh GK, Measurement of Various Parameters of Greater Sciatic Notch of Pelvis. Indian journal of

applied research 2014; **10(4):28-30.**

13 Shah h, Zalawadia A, Ruparelia S, Patel S, Rathod SP, Patel SV. Morphometric study of greater sciatic notch of dry hip bone in Gujrat region. National journal of integrated research in medicine 2011;2(2):27-30.