



A Morphometric Study on Dry Adult Human Sacrum for Determination of Sex

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ABSTRACT

Aim: To determine the sex by dry adult human sacrum

Materials & Methods : This study was performed in Department of Anatomy of N.S.C.B. medical college Jabalpur M.P. during the period of September 2015 to February 2016. This study consists of 77 dry, undamaged human sacrum of known sex (49 male and 28 female) was used.

Results: for all the studied parameters the mean, standard deviation, range in both sexes was observed and "t" and "p" -values were calculated to find out the significant differences between the means for two sexes.

Conclusion: The diagnostic efficacy of sacral index is higher than any other index for sex determination of sacrum however not a single parameter could identify 100% of the bones.

KEYWORDS

Sacrum, Sacral Index, sex determination.

Introduction

Establishing the Identity of human remains is one of the most important aspect in which a Forensic Medicine expert has to give his opinion for an unknown and mutilated dead body. Especially when an unknown skeleton is been supplied for its opinion regarding the identification, bones often survive the process of decay and therefore provide the major evidence of human age and sex after death. The sound knowledge of Anatomy of the bones (morphological and morphometrical data) is essential for identification of age, sex, race and region. Because morphological features of bone also depend on nutritional, geographic and occupational factors.^[1]

Sacral bone carries much of the importance for sex determination. In this study we have chosen the bone sacrum for sex determination for its strength and contributions to pelvic girdle and associated sexual differences .

Sacrum is a large triangular bone forming the poster superior wall of the pelvic cavity, wedged between the two pelvic bones. It is formed by the fusion of five sacral vertebrae and forms the caudal end of the vertebral column. The sacrum consists of trabecular bone enveloped by a shell of compact bone of varying thickness.^[2]

Metric study of sacrum has been done by various authors in foreign countries, but the morphometric study of sacrum for determination of sex in Indian bones has not been done widely. The present study was undertaken to study the morphometric sex difference in central Indian sacrum. In the present study, 77 sacra were observed. The sex determination of these bones was done using different parameters and indices. Observations were tabulated and compared with the results of previous workers.

Materials and method:

This study was performed in Department of Anatomy of N.S.C.B. medical college Jabalpur M.P. during the period of September 2015 to February 2016. This study consists of 77 dry, undamaged human sacrum of known sex (49 male

and 28 female) was used. Anatomical measurements were performed on these specimens by using stainless steel sliding vernier calipers with accuracy of 0.1 mm. Sufficient care is taken and all parameters are measured accurately. To interpret the data was analyzed statistically. The different parameter of each sacrum was studied under the following heading. The accurate method for female or male type sacrum has often been the sacral index method as explained in Hrdlicka's practical Anthropometry.^[3]

Methods: Procedure for measuring the following parameters of each sacrum:

1) Maximum Length of Sacrum:

(Mid ventral Straight Length) measured along the midline of sacrum with the sliding calipers from the middle of the anterosuperior margin of promontory to the middle of antero-inferior margin of the last sacral vertebra.

2) The Maximum width of the Sacrum:

Measured with the sliding calipers by taking two points at the upper lateral most part of Ala of Sacrum. by using above parameters the sacral index was calculated.

$$\text{Sacral index} = \frac{\text{Maximum width of sacrum}}{\text{Maximum Straight length of sacrum}} \times 100$$

Maximum Straight length of sacrum_



Figure 1: Measurement showing the max. straight length of sacrum.



Figure 2: Measurement showing the max. width of sacrum.

OBSERVATIONS: Table no1: Showing the values of present study n=77 (male =49) (female=28)

pa-rameters	Sex	Range	Mean	SD	T- Value	P- value
Sacral index	Male	76. - 118.6	95.66	8.31	10.12	.973
	Female	105.4 -127.0	115.10	7.42		
Max sacral width	Male	85.4 -117	105.05	7.78	4.87	.003
	Female	95.2 - 119	113.27	5.74		
Max sacral length	Male	92.6 - 200	111.86	14.37	4.40	.948
	Female	88 - 110	99.10	6.96		

Results:

For all the studied parameters the mean, standard deviation, range in both sexes shown in table no 1 to this independent student's t-test for equality of means was applied and "t" and "p" -values were calculated to find out the significant differences between the means for two sexes.

The mean maximum length of sacrum in male was 111.86 ± 14.37 and in females it was 113.27 ± 5.74

P value is 0.948 which is considered to be statistically not significant.

The mean maximum width of sacrum in male was 105.05 ± 7.78 and in females it was 113.27 ± 5.74

P value is 0.003 which is considered to be statistically significant.

The mean sacral index for male was 95.66 ± 8.31 and in females it was 115.10 ± 7.42 P value is 0.973 which is considered to be statistically not significant.

Discussion:

Our study was conducted in Mahakaushal region of Madhyapradesh and values of sacral index in male is 95.66 and in females was 115.10. The mean sacral index observed by Patel MM et al. was 96.25 in male and 113.25 in females which was almost equivalent to our study.^[4] Study done by Anterpreet Kaur et al. shows that sacral index was 93.68 in males and 125.35 in females which was slightly higher in female.^[5] The mean sacral index observed by Sibani Mazumdar et al. was 94.9 in male and 109.8 in females which was slightly lower.^[6] The mean sacral index observed by Ravichandran et al. was 96.32 in male and 102.29 in females which was little bit lower in females.^[7] The mean sacral index studied by Poornima Janipati et al. was 104.08 in male and 115.72 in females here this study was very near with our study for females and higher for males.^[8] The estimation of sacral index is of great medico legal importance. A data base for the average sacral index of each and every population is must for identification of sex from skeletal remains.

Table No. 2: present study of sacral index between male and female sexes compared with previous studies.

S.No.	Investigators	Male				Female			
		No.	mean	range	SD	No.	mean	range	SD
1	Patel et al. (2005)	32	96.25	90.5 - 106	4.6	32	113.25	104.8-131	5.7
2	Dr. Anterpreet kaur et al. (2010)	20	93.68	58.9 -128.3	11.5	20	125.35	90.9-159.7	11.4
3	Sibani mazumdar et al. (2012)	127	94.90	80.5 - 109.3	4.8	123	109.80	87.9-131.7	7.3
4	Ravichandran et al. (2013)	63	96.32	80.7 - 106.4	5.4	60	102.29	93.1-108.8	4.0
5	Poornima janipati et al. (2014)	81	104.08	81 -136	16.5	64	115.72	85.0-146.0	13.6
6	Present study (2015)	49	95.66	76.59- 118.6	8.31	28	115.10	105.4 - 127.0	7.4

Conclusion:

The diagnostic efficacy of sacral index is higher than any other index for sex determination of sacrum however not a single parameter could identify 100% of the bones. Hence it could be concluded that for determination of sex of sacrum, maximum number of parameters should be taken into consideration to attain 100% accuracy.

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