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Original Research Paper

A study the sexual dimorphism of a dry human sacral vertebra.

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ABSTRACT:

Background: The sacrum connects to four bones: the final lumbar vertebra above via a disc space and facet joint complex, the coccyx below via a ligamentous connection and occasional bone union, and the ilium on either side via the sacroiliac joint. **Aim and Objectives:** To study different parameters of the sacral vertebra for sexual dimorphism. **Material and Methods:** The shape, apex, and base of the sacral hiatus will be noted with the help of a Sliding vernier caliper, Divider, Steel Measuring Scale, and flexible ribbon tape. **Results**: the depth of the sacral curvature was likewise greater. Men had 11.8 percent larger sacral curvature depths at each segmental articulation than women. **Conclusion:** This study provides indications that the sacra are important bones for sex estimation and they could be effectively used as alternatives in forensic cases when the skull and pelvis are unavailable. This study may be useful for forensic estimation of the stature of individuals, particularly in cases where better predictors such as the long bones are not available.

INTRODUCTION:

Methods for determining the gender of skeletal remains obtained from paleontological, archaeological, and forensic contexts are critical to forensic anthropology, bioarchaeology, and human osteological and evolutionary studies. Because accurate sex estimation is critical, much research has focused on finding and describing the most sexually dimorphic characteristics visible on the skeleton. Metric characters are possibly more straightforward to use because they are based on a statistical analysis of collections of distances, angles, and ratios. Nonetheless, metric systems rely on precise identification and recording of landmarks and/or surfaces, as well as the ability to appropriately characterize complex shapes. Because they are focused on the analysis of two- or three-dimensional Cartesian coordinates of anatomical points (landmarks) that retain all the geometric information in the data throughout the analysis, geometric morphometric methods (1,2) provide a precise and accurate description, visualization, and means of comparison of the differences that exist among complex shapes. The purpose of this study was to look into the sexual dimorphism of the sacrum using geometric morphometric techniques. The human sacrum is a big triangular bone formed by five distinct vertebrae that unite with the intervertebral discs in between (3,4)The sacrum connects to four bones: the final lumbar vertebra above via a disc space and facet joint complex, the coccyx below via a ligamentous connection and occasional bone union, and the ilium on either side via the sacroiliac joint. For almost a century, men's sacrums have been observed to be more curved than women's (5,6). Reduced sacral curvature, in conjunction with posterior sacral angulation, serves to increase the female pelvic exit for birthing (7) and may thus be a valid predictor of sex.

MATERIAL AND METHODS:

Dry human Sacra of unknown sex will be collected and studied from the Department of Anatomy, Index Medical College hospital and research center, after due permission of the institutional ethics committee. The dry sacral bones which are completely ossified without any visible variation or damage will be taken for study

purposes. Additionally, the shape, apex, and base of the sacral hiatus will be noted. Equipment's required for measuring different parameters. Sliding vernier caliper,2. Divider, 3. Steel Measuring Scale and 4. Flexible ribbon tape

OBSERVATIONS AND RESULTS:

Using standardized instruments and procedures, 75 dry human sacra were measured and documented. 35 are female dry human sacra, whereas the remaining 40 are male dry human sacra. Using digital sliding Verniercallipers, standardized flexible ribbon tape, and dividers each linear recording will be taken to the closest millimeter. The thickness of the sacrococcygeal ligament and the width of the sacral canal were both positively connected with the best angle for needle insertion in all samples (P.01). The diameter of the sacral canal, the ideal angle for needle insertion, and the actual angle of needle insertion were all inversely linked with age in only female dry sacra.

Table No: 1. Measurements Between Male and Female

Parameter	Total	Male	Female
Intercornual distance, mm	16. 9 ± 2.7	17. 7 ± 2.7[a]	16.5 ± 2.7
Diameter of sacral canal, mm	5.0 ± 1.6	5.1 ± 1.5	4.9 ± 1.6
Thickness of sacrococcygeal ligament, Mm	4.0 ± 1.1	4.3 ± 1.0[a]	3.9 ± 1.1
Optimal angle for sacral bone	16.7 ± 5.8	16.1 ± 5.0	17.0 ± 6.1
Actual angle of sacral bone	19.5 ± 6.2	19.6 ± 6.4	19.4 ± 6.1

Data are presented as mean ± SD. a P< .05 between male and female patients.

Men had a significantly greater mean intracorneal distance than women (P.01; Table 1). The sacrococcygeal ligament was substantially thicker in men than in women (P =.02; Table 1). The mean diameter of the sacral canal did not differ significantly between men and women. In both men and women, there was a significant difference between the mean optimum angle of sacral bone and the actual angle (P.01; Table 1).

Table No.: 2 Independent samples t-test for sex differences in sacral variables

	Males	Females	% Difference	p (t-test)
Anterior height	98.3 ±10.03	100.1 ± 8.00	1.83	N.S.
Sacral fraction at S1–S2	26.9 ± 3.01	25.5 ± 3.19	5.20	< 0.05
Sacral fraction at S2–S3	51.9 ± 5.01	51.5 ± 3.85	0.77	N.S.
Sacral fraction at S3–S4	71.1 ± 6.26	71.7 ± 5.25	0.84	N.S.
Sacral fraction at S4–S5	87.9 ± 8.02	89.3 ± 6.52	1.59	N.S.
Sacral depth at S1–S2	12.1 ± 4.89	10.5 ± 4.44	13.22	N.S.
Sacral depth at S2–S3	19.1 ±6.58	16.3 ± 5.84	14.66	< 0.05
Sacral depth at S3–S4	18.5 ± 5.33	15.8 ±5.22	14.60	< 0.01
Sacral depth at S4–S5	10.4 ± 2.42	9.9 ±2.76	4.81	N.S.

Table 2 shows the results of the independent sample t-test for gender differences. Except for the first sacral fraction, men and women had similar anterior sacral height and sacral fractions. Men had a substantially longer length along the sacral height from the sacral promontory to the S1–S2 articulation (p 0.05). In men,

the depth of the sacral curvature was likewise greater. Men had 11.8 percent larger sacral curvature depths at each segmental articulation than women. Men had substantially larger sacral depths at S2–S3 and S3–S4 than women (p 0.05). The greatest depth was found at the S2–S3 articulation. In men, this depth was 2.8 mm greater on average (p 0.01).

Table 3: Measured parameters and calculated indices of adult dry sacra

Parameter	Total sacra (n=325)	Female sacra (n=115)	Male sacra (n=210)
Maximum height	10.4±1.47	9.25±1.0**	11.54±0.92**
Maximum width	11.3±0.772	11.5±0.90	11.36±0.57
Maximum curved length	11.4±1.41	10.65±1.30*	12.16±1.17*
Sacral index	110.97±13.54	121.7±9.86**	100. 2±7.03**
Curvature index	91.5±5.89	87.89±5.75**	95.66±2.82**

Student's t test: Significant differences between female and male sacra. *Very significant *P*<0.001, **highly significant *P*<0.0001, Mean±SD.

DISCUSSION:

The depth of the sacral curvature is substantially larger in men at the S2–S3 and S3–S4 articulations. The current study's findings are consistent with those of Stradalova et al (8) and Jeffrey H. Plochocki (9). In both men and women, the maximum sacral curvature depth was consistently found at the S2–S3 junction. In both men and women, there was a substantial disparity between the mean optimum angle of sacral bone and the actual angle. Men had a substantially longer length along the sacral height from the sacral promontory to the S1–S2 articulation (10) In men, the depth of the sacral curvature was likewise greater. In men, the depth of the sacral curvature was likewise greater. Men had 11.8 percent larger sacral curvature depths at each segmental articulation than women. Men had considerably larger sacral depths at S2–S3 and S3–S4 than women. The current findings are consistent with those of evident et al.

CONCLUSION:

It is required to test the current study's results on a bigger sample, preferably one of known sex, which will include specimens from diverse historical and geographical regions, as previous research has shown that different populations may require different criteria for determining their sex. This paper provides indications that the sacra are important bones for sex estimation and they could be effectively used as alternatives in forensic cases when the skull and pelvis are unavailable. This study may be useful for forensic estimation of the stature of individuals, particularly in cases where better predictors such as the long bones are not available.

REFERENCES:

1. Slice DE. Geometric morphometrics. Annu Rev Anthropol 2007;36: 261–81.
2. Richtsmeier JT, Deleon BV, Lele SR. The promise of geometric morphometrics. Yearb Phys Anthropol2002;45:63–91.
3. Agur AMR: Grant's Atlas of Anatomy, ed 10. Philadelphia: Lippincott Williams & Wilkins, 1999.
4. Gray H: Anatomy of the Human Body. Philadelphia: Lea &Febiger,2003; 1918.
5. Warren E. An investigation on the variability of the human skeleton.Philos Trans R Soc Lond B 1897;189:398–401.
6. Bass WM. Human osteology: a laboratory and field manual, 4th edn.Columbia, MO: Missouri Archaeological Society, 1995.
7. Tague RG. Do big females have big pelves? Am J Phys Anthropol,2000;112:377–93.
8. Stradalova V. Determination of sex from metric characteristics of the sacrum. Folia Morphol1974;22:408–12
.
9. Plochocki JH. Morphometric age-related change in the adult human sacrum [thesis]. Wichita (KS): Wichita State Univ., 1999.
10..Tague RG. Costal process of the first sacral vertebra: sexual dimorphism and obstetrical adaptation. Am J Phys Anthropol2007;132:395–405.