

A Metric Study on Sexual Dimorphism of Human Sacrum in Saurashtra Region



Medical Science

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ABSTRACT

A study for determination of sex of human sacrum was carried on 66 dry human sacra in which 51 were male and 15 were female of known sex. These were collected from the department of anatomy, M P Shah Govt. Medical College, Jamnagar. Various parameters like mid ventral straight length, anterior straight breadth, mid ventral curved length, & transverse diameter of body of 1st sacral vertebra (Breadth of 1st sacral vertebra) were measured. By using these parameters various indices like sacral index, curvature index & Corporo-basal index were calculate and statistically analyzed. After detailed study it could determined that mid ventral straight length, mid ventral curved length & sacral index were significant for determining sex of sacrum in Saurashtra region.

Introduction:

Sex determination of Human Sacrum will be useful for all anatomists, experts in forensic medicine and physical anthropologists. It's very difficult to determine 100% of sex by measuring only parameters and indices. A morphological & radiological study of sacrum may add for further accuracy. There is variation in the relative length and breadth of the sacrum in different races of men, and also in some races the length exceeded the breadth and that in others an opposite relation prevailed that differences can be expressed by various methods.¹

The sacrum is large, flattened, triangular bone formed by the fusion of five sacral vertebrae & forms the posterior superior part of bony pelvis.² Sacrum is one of the bones that exhibit sex differences; hence it is used in the identification of skeletal remains. Till now the various Indian and non-indian workers have worked on skull and pelvis for determination of sex. However, it is observed that there is less work done on the sacrum. Therefore the present work is an attempt to establish sex of sacrum by measuring various indices and it will be of great help in sexual dimorphism, both in anthropometric and medico legal study.

Material & Method:

Materials used in present study were 66 sacra (51 male & 15 female) of known sex. They were collected from department of anatomy, M P Shah Govt. Medical College, Jamnagar (Gujarat). Selected sacra were adult, fully ossified & of known sex, and fractured, pathological, lumbarization, sacralization and of unknown sex were excluded. Instruments that were used in present study are stainless steel sliding vernier caliper & flexible ribbon tap. Demarcating points (By calculating mean \pm 3SD) were recorded; from these we can determine that the sacrum is definitely male or definitely female. Therefore by getting percentage beyond demarking point (DP), we can calculate percentage of definitely male or female sacrum. In sort, we can "statistically fixed" a measurement above which it is either definitely male or definitely female. This point is known as demarking point.

The details of the parameters taken are as follows:

Mid ventral straight length (Fig.1): MVSL is measured by stainless steel sliding caliper from promontorium in mid-sagittal plane to corresponding point on antero - inferior margin of the last sacral vertebra (tip of sacrum).³ **Mid ventral curved length (Fig.2):** MVCL is measured by Standardized flexible ribbon tape from anterior margin of middle of promontory to antero - inferior margin of the last sacral vertebra (tip of sacrum) along the concavity of the anterior surface of the sacrum.³ **Anterior straight breadth (sacral breadth) (Fig.3):** ASB is measured by stainless steel sliding caliper maximum transverse breadth of the sacrum in the level of anterior projection of auricular surface.³ **Transverse diameter of body of S1 vertebrae (Maximum transverse diameter of sacral basis) (Fig.4):** TDS1

is measured by stainless steel sliding caliper by taking one point on each side of the lateral most point on the superior surface of body of S1 vertebrae.³ Indices were calculated:

1. Sacral Index = MVSL/ASB X 100
2. Curvature Index = MVSL/MVCL X 100
3. Corporo-Basal Index = TDS1/ASB X 100



Fig.1 MVSL



Fig.2 MVCL



Fig.3 ASB



Fig.4 TDS1

Observation:

The mean, mean \pm 3SD, demarcating point and percentage be-

yond demarcating point, p value and significant level of various parameters were recorded (table – 1)

Table 1: showing various parameters of sacrum and their statistical analysis

No.	Parameter	SEX	Mean	Mean ± 3SD	Demarcating point (DP) cm	P value	Significance level
1	Mid ventral straight length (MVSL)	M	11	7.32	>12.47	0.0001	Significant
		F	9	6.37-12.47	<7.32		
2	Mid ventral curved length (MVCL)	M	11.40	8.14-14.56	>13.17	0.0001	Significant
		F	9.97	6.77-13.17	<8.14		
3	Anterior straight breadth (ASB)	M	9.80	7.63-12.6	<7.23	0.093	Insignificant
		F	9.58	7.23-11.93	>12.6		
4	Transverse diameter of body of S1 (TDS1)	M	4.70	3.35-6.1	>6.69	0.12	Insignificant
		F	4.41	2.13-6.69	<3.35		
5	Sacral index	M	93.54	66.41-120.67	>144.1	0.021	Significant
		F	102.8	61.5-144.1	<66.41		
6	Curvature index	M	93.33	82.7-103.96	>108.3	0.066	Insignificant
		F	94.6	81-108.3	<82.7		
7	Corporo-basal index	M	48.11	34.65-61.58	>71.1	0.207	Insignificant
		F	46.2	21.3-71.1	<34.65		

When P value is between 0.05-0.01, it is statistically significant, P value <0.01 is statistically highly significant, & P value <0.005 is statistically very highly significant.⁴

Discussion:

In the present study effort has been made to find the sex of the sacrum with the available data in relation to the various parameters. Mean value of mid ventral straight length were measured by davivongs⁵ were less than other Indian workers, So we can say different races having different size of sacrum. Various Indian workers like raju et al (1980)⁶, Mishra et al (2003)⁷, Arora et al (2008)⁸, Kanika et al (2011)⁹, Jyothinath et al(2012)¹⁰, Mazumdar S et al (2012)¹¹, maddikunta V et al (2013)¹², shailendra et al (2014)¹³, & Somesh M S et al (2015)¹⁴ also measured mid ventral straight length. All workers found statistically highly significant difference between male and female (p value is <0.001) for mid ventral straight length of sacrum, so mid ventral straight length or sacral length was important & significant for determination of sex of sacrum. In mid ventral curved length, mean value of mid ventral curved length were also less in australian arborigins (Davivongs)⁵, than Indian workers. Mishra et al (2003)⁷, Kanika et al (2011)⁹, Jyothinath et al(2012)¹⁰ & Maddikunta V et al (2013)¹², also measured mid ventral curved length and found statistically significant difference between male and female (p value is <0.001) for mid ventral straight length of sacrum. Significance level of anterior straight breadth is very low, % of bone identified were almost nil, as calculated by various authors. Various Indian worker like raju et al (1980)⁶, Mishra et al (2003)⁷, Arora et al (2008)⁸, Kanika et al (2011)⁹, Jyothinath et al(2012)¹⁰, Mazumdar S et al (2012)¹¹, maddikunta V et al (2013)¹², shailendra et al (2014)¹³, & Somesh M S et al (2015)¹⁴. Though Arora et al (2008)⁸ found statistically significant value for anterior straight breadth (p value was <0.0002). He concludes that width

of sacrum was relevant and more significant for determination of sex. Many workers worked on transverse diameter of body of S1. Davivongs (1963)⁵, Raju et al (1980)⁶, & Mishra et al (2003)⁷ has got statistically significant values for transverse diameter of body of S1 (p value <0.001). Raju et al (1980)⁶ stated in him conclusion that transverse diameter of body of S1 is more reliable and significant criteria for sex determination of sacrum. Jyothinath et al(2012)¹⁰ & Maddikunta V et al (2013)¹² has got statistically insignificant values. Many workers worked on various indices like Sacral index, Curvature index & Corporo-basal index. Almost all workers including present study have got significant values for sacral index. Study done on curvature and corpora-basal indices were almost not or less significant by various workers. In present study curvature index and corpora-basal index were statistically insignificant.

Summery & conclusion:

After detailed calculation, data arrange in tabulated form. And comparison of data of the present is done with other studies of same kind. So, from detailed study it would be conclude that mid ventral straight length & mid ventral curved length which is highly significant for determination of sex of sacrum. And indices sacral index is highly significant while other curvature and corpora-basal indices are not significant for the determination of sex of sacrum. So in present study these two parameters i.e. mid ventral straight length & mid ventral curved length and one index i.e. sacral index are highly significant for determination of sex of sacrum in Saurashtra region.

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