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RESEARCH ARTICLE

Sexual dimorphism by subtrochanteric antero posterior diameter of femur in Gujarati population

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Abstract

Introduction: Femur is the longest and strongest bone in human body. Determination of sex is relatively easy if the entire skeleton is available for examination. In the absence of skull and pelvis long bones either individually or in combination has been used for determining sex.

Material and methods: Present Study was carried out on 141 human femora (115 male, 26 female) of known sexes in Anatomy Department, M. P. Shah Government Medical College, Jamnagar, Gujarat by using demarcating point method. The sub trochanteric antero posterior diameter of the upper end of the shaft of femur taken right angle to the transverse diameter of the upper end of the shaft of femur, Where it shows maximum lateral projection. When the lateral projection is not clear, this measurement is taken 5 cm below the base of lesser trochanter, measured with caliper.

Results: Average Sub trochanteric antero posterior diameter of right male femur was 25.56 mm, average Sub trochanteric antero posterior diameter of right female femur was 23.58 mm, average Sub trochanteric antero posterior diameter of left male femur was 25.77 mm and average Sub trochanteric antero posterior diameter of left female femur was 22.86 mm. DP for Sub trochanteric antero posterior diameter of right male femur was >28.45 mm and for right female femur was <19.14 mm, while for left male femur >29.39 mm and for left female femur <18.56 mm. DP method identified 7.27 % right and 11.67 % left male femur correctly as male.

Conclusion: Mean sub trochanteric Antero posterior diameter of male femur is more than female femur in the Gujarati population of present study. Findings of the present study may be useful in medico legal cases for estimation of sex from available fragmentary femora. The study can also be useful to anatomist & physical anthropologist.

INTRODUCTION

Femur is the longest and strongest bone in human body. [1] The word femur is derived from Latin word "femur" means a thigh or it may derive from "ferendum", a Latin word means bearing. [2]

Determination of sex is relatively easy if the entire skeleton is available for examination. For determination of sex accurately, skull and pelvis are the highly reliable skeletal element. [3]

Sometimes determination of sex becomes a difficult task for the forensic anthropologist, especially in the absence of the skull and pelvis. So, most of the long bones, either individually or in combination, have been subjected to statistical and morphological analysis for determining sex. Sexual dimorphism in the femur is due to modification of the female pelvis with respect to its specialized function of reproduction. Therefore, the stress and strain experienced by the femur is different in a male than it is in a female. [4]

The study of sexual dimorphism of subtrochanteric Antero posterior diameter of femur has been carried out by other workers in different population, but in Gujarat few studies have been done. So, the present study has been carried out to establish sexual dimorphism of subtrochanteric Antero posterior diameter of femur in Gujarati populations.

Material and methods

Present Study was carried out on Dry femora of known sexes in Anatomy Department, M. P. Shah Government Medical College, Jamnagar, Gujarat. The femora were obtained by maceration of the dead bodies received as voluntary donations or unclaimed bodies received at this department. A total of 141 human femora (115 male, 26 female) were used for the present study. Femora showing pathological abnormality, fractured and unknown sex were not included in study.

First of all, side of each femur will be determined. To avoid intra- observer error, each measurement was taken at three different times and their average was used as final reading. The present study was conducted after taking approval from the Institutional Ethics Committee.

The sub trochanteric antero posterior diameter of the upper end of the shaft of femur taken right angle to the transverse diameter of the upper end of the shaft of femur, Where it shows maximum lateral projection. When the lateral projection is not clear, this measurement is taken 5 cm below the base of lesser trochanter, measured with caliper. [5] **(Photograph 1)**

Demarcating point (DP) for femur: [6]

Demarcating point was measured by using mean ± 3SD (calculated range, cover 99.75% of sample) for all the parameters.

Demarcating point for maximum length of both male and female femur was calculated as follows: Greatest length recorded for the female femur by using calculated range was the demarcating point for male femur and the shortest length recorded for the male femur by using the calculated range was the demarcating point for female femur.

All bones having length more than the Demarcating point for male was identified as male femur and all bones having length less than the Demarcating point for female was identified as female femur.

Results

As shown in table 1, average Sub trochanteric antero posterior diameter of right male femur was 25.56 mm, average Sub trochanteric antero posterior diameter of right female femur was 23.58 mm, average Sub trochanteric antero posterior diameter of left male femur was 25.77 mm and average Sub trochanteric antero posterior diameter of left female femur was 22.86 mm.

DP for Sub trochanteric antero posterior diameter of right male femur was >28.45 mm and for right female femur was <19.14 mm, while for left male femur >29.39 mm and for left female femur <18.56 mm. DP method identified 7.27 % right and 11.67 % left male femur correctly as male.

Data for sub trochanteric Antero posterior diameter of femur of both sides male and female was statistically highly significant, as p value was <0.01

Mean sub trochanteric Antero posterior diameter male femur was more than the mean mid shaft Antero posterior diameter of female femur and the data was statistically highly significant, as p value was <0.01.

Photograph 1:- Showing sub trochanteric antero posterior diameter of femur.

Statistical values	RIGHT		LEFT	
	Male(N=55)	Female(N=12)	Male(N=60)	Female(N=14)
MEAN (mm)	25.56	23.58	25.77	22.86
SD (mm)	2.14	1.62	2.40	2.18
3SD (mm)	6.42	4.86	7.21	6.54
MEAN ±3SD(mm)	19.14-31.99	18.72-28.45	18.56-32.98	16.32-29.39
DP (mm)	>28.45	<19.14	>29.39	<18.56
% of DP(N)	7.27 (4)	0.00 (0)	11.67 (7)	0.00 (0)
P VALUE	<0.01		<0.01	
REMARKS	Highly significant		Highly significant	

Table 1 Showing the sub trochanteric antero posterior diameter of femur (mm) and its statistical analysis (N= number, SD=standard deviation, mm= millimeter, DP = demarcating point)

Author	Popula-tion	Sex	No.	Mean (mm)	SD (mm)	DP (mm)	% Of Identified Bones	P value	Rem-ark
Dittrick J& Myers (1986) [7]	California	M	177	28.9	2.8	-	68.00	-	-
		F	173	26.3	2.7	-			
Liu wu (1989) [8]	Chinese	M	74	26.1	2.2	-	-	<0.001	HS
		F	67	22.9	1.6	-	-		
Slaus M (2003) [9]	Croatian	M	104	28.88	2.33	-	--	<0.0001	HS
		F	91	25.87	2.24	-	-		
Present study	Gujarat	M	115	25.67	2.27	>29.01	8.70	<0.01	HS
		F	26	23.19	1.93	<18.85	0	<0.01	HS

Table 2 showing the comparison of sub trochanteric anteroposterior diameter of male and female femur (mm) of Gujarati population with the findings of other workers (N= number, mm= millimeter, M= male, F= female, R= right, L=left, HS = highly significant)

Discussion

In present study found that the mean Sub trochanteric anteroposterior diameter of male femur was higher than the female femur & it was statistically highly significant which is similar with findings Liu wu [8] and Slaus M et al [9].

In present study, By using DP method for Sub trochanteric anteroposterior diameter of femur, 8.70 % of male femur was correctly identified as male & 0% female femur was identified.

Dittrick J & Myers, correctly identified male and female femora using only Sub trochanteric antero posterior diameter of femur in 68.00 % femora by discriminate analysis. [7]

The Sub trochanteric antero posterior diameter of Gujarati population is less than the Sub trochanteric antero posterior diameter of California & Croatian population.

There was more marked difference in Sub trochanteric diameter of femur between the present study & Dittrick J & Myers [7] is the low percentage of correct sexual classification in the Sub trochanteric diameter of femur in present study. This could be explained on the basis of statistical method applied. While the studies referred above were based on discriminate analysis, present study had used the demarcating point analysis.

Conclusion

Mean Sub trochanteric antero posterior diameter of male femur is more than the mean Sub trochanteric antero posterior diameter of female femur in the Gujarati population of present study. In Gujarati population, if Sub trochanteric antero posterior diameter of male femur is >29.01 mm than it is definitely male femur and if it is <18.85 mm than it is definitely female femur.

The Sub trochanteric antero posterior diameter of Gujarati population is less than the Sub trochanteric antero posterior diameter of California & Croatian population.

Findings of the present study may be useful in medico legal cases for estimation of sex from available fragmentary femora. The study can also be useful to anatomist & physical anthropologist.

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