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The Study Of Interarticular Length And Mediolaral Width At Midshaft For Sexing Of 1st Metacarpal From Saurashtra Region

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ABSTRACT

Metacarpal bones are of great importance to anatomist, anthropologist and forensic experts for routine teaching purpose and analyzing quantitative and qualitative characters in the skeleton remains. The aim of the present study was to provide various parameters of 1st metacarpal bones from Saurashtra populations. 42 sets of 1st metacarpal bones were measured and their dimensions were compared with the dimensions of Spanish population and American white populations. The mean, SD, t value and p value were calculated, and demarking point method for sexual dimorphism was employed.

Keywords : metacarpal, interarticular length, mediolaral width

Introduction:

According to Field E.J. & Harrison R.J. (1947), the word metacarpal is derived from Greek word, Meta means after and carpus means wrist. Hence that part of the hand in which the metacarpus is placed and which is distal to the wrist. According to Barrio PA, Tranco GJ, Sanchez JA, (2006), in human society, each day sees accidental deaths and criminal activities requiring investigative techniques that are precise enough to identify the deceased. Examples where this is important are catastrophes, floods, fires, homicide, terrorist acts, etc., in which fragmented or incomplete skeletal remains are often present. According to Scheuer JL & Elkington NM (1993), in both the forensic and archaeological analysis of human skeletal remains the determination of sex is the first and arguably the most important step. If this assessment is correct, then further investigations are likely to be more accurate as separate male and female standards may then be used for estimation of both age and stature. Hence the present study was undertaken to measure the osteometric dimensions of various metacarpals and to compare the readings with various authors. By creating various models so as to help forensic specialist in identification of sex and race of the individual in the absence of any additional information.

Materials and method:

Material of study consisted of 42 set of normal (free from any changes) human metacarpal bones of both side were obtained from anatomy department M.P.Shah Medical College, Jamnagar.

Following methods are used as was described by AB Falsetti (1995).

- 1). Interarticular length: It is length measured between midline of head to the midline of base of metacarpal by use of vernier caliper.
- 2). Mediolaral width at midshaft: It is width measured in the mediolaral plane at midpoint of shaft (i.e. midpoint between head and base of metacarpal) by use of vernier caliper.

All the above measurement was carried out from male and female metacarpals of right and left side and then mean was recorded from this sample and after that standard deviation was taken. The statistical analysis ('t' test) was applied on data of male and female right side and male and female left side samples given in table No.2. The 't' test is an accurate method to test the significance of difference between two means or proportions in small samples.

Discussion:

Table 1: Comparison of different diameter of 1st metacarpal bone.

	Diameter	Sex	Side	Barrio et al (2006) Spanish population (n=79)		Burrows et al (2003) American white (n=23)		Case & rose (2007) American white (n=259)		Scheuer & Elkington (1993) British white (n=60)		Present study (n=42)	
				Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
				INTERARTICULAR Length		INTERARTICULAR Length		INTERARTICULAR Length		INTERARTICULAR Length		INTERARTICULAR Length	
Length	Male	R	46.49	2.32	46.31	2.33	46.86	3.44	44.12	3.72	45.41	2.37	
		L	46.11	2.75									46.83
	Female	R	41.57	2.32	43.14	3.24	42.79	2.63	41.65	3.46	42.33	2.62	
		L	41.61	2.31			42.68	2.69			42.83	3.48	
width at midshaft	Male	R	12.28	1.00	12.52	1.28					11.22	1.24	
		L	11.99	1.11									11.05
	Female	R	10.88	1.08	11.18	0.90					10.16	0.36	
		L	10.48	1.10									10.00

Table2: Bisexual dimorphism of different diameter of 1st metacarpal bone.

Diameter	side	Male			Female			t value	p value
		Mean±3S.D.	Demarking point	Percentage & no. beyond demarking point	Mean±3S.D.	Demarking point	Percentage & no. beyond demarking point		
inter articular length	R	38.30-52.52	>50.19	0%	34.47-50.19	<38.30	16.66% (1)	1.28	>0.05
	L	38.24-52.64	>50.11	0%	32.39-50.11	<38.24	16.66% (1)	1.01	>0.05
medio lateral width at midshaft	R	7.50-14.94	>11.24	36.11% (13)	9.08-11.24	<7.50	0%	0.90	>0.05
	L	7.75-14.35	>12.28	13.88% (5)	7.72-12.28	<7.75	0%	1.00	>0.05

INTERARTICULAR LENGTH:**(a) male:**

Comparison of interarticular length of male in 1st metacarpal between present study and other studies has been shown in Table No.1 Mean value of Interarticular length of metacarpal of male in present study was 45.41(right) & 45.44(left) in other study it varied from 46.11mm to 46.86mm. Interarticular length in 1st metacarpal in saurashtra region was lower than the Spanish population (Barrio et al. 2006) & American white (case and rose 2007) & American white (Burrows et al. 2003), the obvious reason could be that the

average height of Spanish & American population was more than the Indian population. Henceforth the length of metacarpals were also larger than that of Indian population.

(b) Female:

Comparison of interarticular length of female in 1st metacarpal between present study and other studies has been shown in Table No.1 Mean value of Interarticular length of metacarpal of female in present study was 42.33(right) & 42.83(left) in other study it varied from 41.57mm to 43.14mm.

(c) Sex difference:

Generally male bones are longer and massive, and this difference is reflected by the greater values of the mean of Interarticular length in male on both sides than female.

Calculated t-value and p-value showed that the difference in the mean interarticular length in male and female was statistically less significant with $p > 0.05$ in right and left side For right male bone calculated range was 40-50mm and for right female bone calculated range was 38-46mm. With the help of these demarking points, right 1st metacarpal with Interarticular length > 50.19 can be correctly classified as male and right 1st metacarpal with Interarticular length < 38.30 can be correctly classified by as a female. However if the length of bone is between 38.30mm and 50.90mm sexing was not possible due to overlapping.

Demarking point analysis when applied to study group identified sex of right male bone was 0.00% and for female right bone definitely identify a sex of 1 bone out of 6 (16.66%). For left male bone calculated range was 40-50mm and for left female bone it was 37-49mm. With the help of demarking point for left male bone (> 50.11) we can correctly identify a sex was 0.00% and for female left bone (< 38.24), demarking point will definitely identify a sex of a 1 bone out of 6 (16.66%).

MEDIOLATERAL WIDTH AT MIDSHAFT:**(a) male:**

Comparison of M.L. width at midshaft of male in 1st metacarpal between present study and other studies has been shown in Table No.1 Mean value of M.L. width at midshaft of metacarpal of male in present study was 11.22(right) & 11.05(left) in other study it varied from 11.99mm to 12.52mm.

M.L. width at midshaft in 1st metacarpal in saurashtra region was lower than the Spanish population (Barrio et al. 2006) & American white (Burrows et al. 2003).

(b) Female:

Comparison of M.L. width at midshaft of female in 1st metacarpal between present study and other studies has been shown in Table No.1 Mean value of M.L. width at midshaft of metacarpal of female in present study was 10.16(right) & 10.00(left) in other study it varied from 10.48mm to 11.18mm.

M.L. width at midshaft in 1st metacarpal in saurashtra region was lower than the American white (Burrows et al. 2003) and the Spanish population (Barrio et al. 2006).

The anteroposterior width & mediolateral width at midshaft indicates the thickness of metacarpal which is more in spanish & American white population.

(c) Sex difference:

Mean value of M.L. width at midshaft was higher in male as compared to female. Calculated t-value and p-value showed that the difference in the mean M.L. width at midshaft in male and female was statistically less significant with $p > 0.05$ in right and left side

For right male bone calculated range was 9-14mm and for right female bone calculated range was 10-11mm.

With the help of these demarking points, right 1st metacarpal with M.L. width at midshaft > 11.24 can be correctly classified as male and right 1st metacarpal with M.L. width at midshaft < 7.50 can be correctly classified by as a female. However if the M.L. width at midshaft of bone is between 7.50mm and 11.24mm sexing was not possible due to overlapping.

Demarking point analysis when applied to study group identified sex of right male was 13 out of 36(36.11%) and female was 0.00%. For left male bone calculated range was 9-13mm and for left female bone it was 9-11mm With the help of demarking point for left male bone (> 12.28) we can correctly identify a sex 6 out of 36(16.66%) and for left female bone (< 7.75) correctly identify sex was 0.00%.

Conclusion:

Thus by providing various data on the parameters of 1st metacarpal, the present study has shown that models of 1st metacarpal could be created that would help anatomists and forensic specialists in identification of race & sex of the individual.

Thus by demarking point method the most effective parameters for sexing of 1st metacarpal are interarticular length in female of right bone 1 bone out of 6 (16.66%) and left bone 1 out of 6 (16.66%). and mediolateral width at midshaft diameter in male of right side bone is 13 out of 36(36.11%) and for left bone 6 out of 36(16.66%).

Therefore the present study had employed the demarking point method along with 't' value & 'p' value which no other research scientist had earlier mentioned.

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