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Morphometric Study of Humerus in Western Region of India

KEYWORDS: Morphometry, Humerus, length, width

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ABSTRACT *The morphometric measurements of different parameters of Humerus were studied in 162 dry paired humeri in western region of India. Each Humerus is measured for 13 parameters by using osteometric board and vernier caliper. The data were tabulated as mean, S.D., S.E.M. and statistically compared between right and left side. No significant difference was found in morphometric measurements between right and left side specimens. The findings of the present study forms an important reference for scientific research and the details are also important for anthropologists and orthopedic surgeons.*

INTRODUCTION

Estimating the stature from bones plays an important role in identifying unknown bodies, part of bodies or skeletal remains. Anthropometric techniques have been commonly used to estimate stature and bone length from the skeletal remains and unknown body parts by anthropologists, medical scientists and anatomists for over hundred years (Ozaslan et al. 2003). Mall et al. (2001) mention that knowing the mean values of humerus segments is very important for anatomic and forensic science and helps the investigator to define the identity of skeleton . The Humerus is one of the strongest long bone of the skeleton which, even in a fragmented state is likely to be recovered in a forensic case as described by Kranioti et al (2009).

Therefore, the present study was done to determine the mean values of different parameters of Humerus in western region of India which may be, useful to anatomists, forensic experts & to the orthopaedic surgeons operating in this region.

MATERIALS AND METHODS

The study was carried out on 162 paired dry human humeri (right-82 & left-82). Out of these 50 pairs were obtained from collection of anatomy museum of rural medical college, Loni and remaining procured from the unclaimed cadavers available in the department. The age of the donors was between 30-60 years. The humeri with gross evidence of disease were excluded from the study. The following parameters were measured:

A: Maximum length of Humerus. It is the maximum distance between most proximal point of head of Humerus to the most distal point of trochlea of Humerus.

B: The distance between most proximal point of articular surface of head to most proximal point of greater tubercle.

C: The distance between most proximal point of articular surface of head to most distal point of anatomical neck.

Figure 1: Shows measurements of Humerus on Osteometric board

D: Distance between most proximal point and most distal point along the edges of olecranon fossa.

E: Distance between most proximal and distal point of trochlea of humerus.

F: Distance between most proximal point of olecranon fossa and most distal point of trochlea.

H: Maximum width of olecranon fossa.

I: Maximum depth of olecranon fossa.

J: Circumference of anatomical neck.

K: Circumference of surgical neck.

L: Maximum width at the middle of shaft.

M: Maximum width at the lower end of shaft.

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All the measurements are recorded separately for left and right humeri. Means, SD and SEM were calculated for each measurement. Unpaired't' test was used to determine if there were any significant difference in the mean values of these dimensions of right and left side.

RESULTS

The means, S.D., S.E.M. and 'p' value of all measurements of right and left sides are shown in Table 1 and Table 2 respectively. The length is measured in cms and all other parameters measured in mms. The unpaired't' test is applied and comparison is made between right and left side measurement. All the values on right and left side having p >0.05 so the difference between right side and left side measurements are not statistically significant.

Table 1
Showing Results of Right Humerus

	Mean	S.D.	S.E.M.	P value
A	29.91	2.01	0.22	0.18
B	6.8	0.20	0.02	0.54
C	29.0	0.34	0.03	0.55
D	16.2	0.31	0.03	0.48
E	16.1	0.24	0.02	0.25
F	31.7	0.32	0.03	0.79
G	53.8	0.49	0.54	0.53
H	12.8	2.31	0.25	0.23
I	7.51	0.82	0.09	0.39
J	5.92	0.60	0.06	0.40
K	6.54	0.70	0.78	0.35
L	1.25	0.38	0.04	0.17
M	2.33	0.21	0.02	0.38

Table 2
Showing Results of Left Humerus

	Mean	S.D.	S.E.M.	P value
A	29.49	1.99	0.22	0.18
B	6.3	0.63	0.07	0.54
C	28.7	0.31	0.03	0.55
D	15.9	0.35	0.03	0.48
E	16.6	0.33	0.03	0.25
F	31.8	0.28	0.03	0.79
G	58.3	0.53	0.05	0.53
H	12.46	1.02	0.11	0.23
I	7.4	0.84	0.09	0.39
J	5.82	0.90	0.09	0.40
K	6.50	0.62	0.68	0.35
L	1.99	0.25	0.02	0.17
M	2.30	0.23	0.02	0.02

DISCUSSION

The morphometric data of present study was compared with other studies and shown in Table 3.

Table 3

		Present Study	Akman et al.	Somesh et al.	Desai et al.	Rai & Chawla
A	R	29.90	30.7	30.9	29.2	30.2
	L	29.49	30.4	29.9	28.9	29.7
B	R	6.8	6.5	5.9	6.9	6.4
	L	6.3	6.6	5.8	7.8	6.5
C	R	29.0	41.0	37.1	39.9	39.3
	L	28.7	40.9	37.2	39.1	39.2
D	R	16.2	24.2	20.1	38.3	27.4
	L	15.9	23.9	19.0	39.7	27.5
E	R	16.1	20.0	37.2	21.2	26.1
	L	16.6	19.7	16.8	20.7	22.1
F	R	31.7	40.6	37.2	25.7	34.5
	L	31.8	39.7	35.7	22.5	32.6

The mean length (A) of the humerus in present study is comparable to that of Desai et al. and slightly higher values are seen in studies by Akman et al., Somesh et al. and Rai and Chawla. The mean distance between the head and proximal part of greater tuberosity (B) in our study is similar to that of other studies but the values are slightly lower in study by Somesh et al. This distance is important in cases of proximal humeral fractures, which extends along the epiphyseal lines of the proximal humerus and its segments, causing their displacements to various degrees as described by Somesh et al (2011). The distance between the proximal and distal articular margins of olecranon fossa (D) was found to be less in present study as compared to other studies. This is due to the fact that the humeri used in the present study are of unknown sex. Many studies on sexual dimorphism of humerus describe that the values are smaller in female specimens than males (Kranioti et al. 2008). The distance between the proximal and distal margin of trochlea (E) in present study is less as compared to other studies but similar to the study of Hegazy A. (2013) who measured the dimensions of distal end of humerus on radiography. The lower values in present study may be due to the differences in shape of olecranon fossa in different individuals. The distance between the two epicondyles of humerus (G) is comparable to that of study by Hegazy A. According to Galano et al. (2010) the intra-articular fractures of the distal humerus constitute 0.5-0.7% of all fractures and 30% of elbow fractures. Therefore, the understanding of anatomy in this region is important for orthopedicians operating in this region. The remaining measurements from H to M could not be compared with other studies as we did not come across any reference with these measurements.

In conclusion, this study forms an important reference for scientific research and the details are also important for anthropologists and orthopedic surgeons.

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