ORIGINAL RESEARCH PAPER

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THE MORPHOMETRIC STUDY OF DISTAL END OF HUMERUS

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ABSTRACT

Humerus is long bone in the arm presents with two expanded ends- upper end and lower end. Morphometric measurements of olecranon fossa are important since olecranon fractures occur in 10% of all upper extremity lesions. The present study was conducted to measure the different morphometric analysis distal end of humerus. The study was conducted by 100 dry humerii. Detailed morphometry of distal aspect was measured on both surfaces with Vernier caliper and measuring tape. In our study, mean value of five distal segments of humerus as were recorded and comapared to other studies. This study helps in forensic, anatomic and archeological fields in order to identify unknown bodies as well as for the orthopedic surgeons for the treatment of distal humerus fractures for their reconstruction in case of extensive damage to those parts of the humerus.

INTRODUCTION

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 a hundred years. Knowing the mean values of humerus segments is very important for anatomic and forensic science and helps the investigator to define the identity of a skeleton. Complex distal humerus fractures provide reconstructive problems and complications such as damage to the nerve and blood vessels. Therefore these fractures are difficult for orthopedic surgeons to treat. Various implants are available for the diverse fracture patterns observed in the distal humerus and these are contoured specifically for the anatomy of this region. Several companies have developed anatomically based precontoured condylar plate systems that can assist with fracture reduction. The knowledge of the morphometric values of humerus segments is important in order to identify unknown bodies and stature. It is also helpful for the clinician in the treatment of distal humerus fractures.

MATERIALS AND METHODS:

Dry humerii bones of both the sides were obtained from the museum of anatomy department were used in this study. Morphometric measurements were done in all the bones. Damaged bones were not considered for the study. The parameters of humerus were measured by using vernier caliper and measuring tape. Following measures are taken:

D1 - Horizontal distance from medial epicondyle to lateral epicondyle.
D2 - Horizontal distance from medial margin of trochlea to capitulum.
D3 - Maximum transverse diameter of trochlea.
D4 - Horizontal distance from medial epicondyle to capitulum.
D5 - Anteroposterior diameter of the trochlea.

(A-B) - distance between proximal edge of olecranon fossa and trochlea are measured.
(C-D) - distance between proximal and distal point of olecranon fossa,
(D-E) - distance between distal part of olecranon fossa and trochlea, Mean and standard deviation of these measurements were calculated.

RESULTS:

Table 1: Mean & SD of various measurements of humerus

Measurement	Mean ± SD (cm) Right sided humerus	Mean ± SD (cm) Left sided humerus
D1	5.80 ± 0.40	5.72 ± 0.46
D2	4.07 ± 0.63	4.10 ± 0.68
D3	2.24 ± 0.22	2.24 ± 0.22
D4	5.63 ± 0.37	5.60 ± 0.45
D5	1.56 ± 0.18	1.56 ± 0.18
(A-B)	3.50 ± 0.30	3.70 ± 0.20
(C-D)	2.00 ± 0.20	2.10 ± 0.20
(D-E)	1.50 ± 0.20	1.60 ± 0.20

DISCUSSION

Ashiyani et al in 2016 have measured mean value of the five distal segment of humerus as mentioned below. D1-5.66 ± 0.36 & 5.58 ± 0.42 cm on right & left side respectively; D2-3.87 ± 0.25 & 3.90 ± 0.30 cm on right & left side respectively; D3-2.26 ± 0.18 & 2.24 ± 0.20 cm on right & left side respectively; D4-5.42 ± 0.33 & 5.39 ± 0.41 cm on right & left side respectively; D5-1.45 ± 0.15 & 1.45 ± 0.17 cm on right & left side respectively.

Sales AD et al have measured mean value of the total humerus length & proximal and distal segment of humerus of Brazilian population. When we compare our data with those given by Sales AD et al, mean values of different segments are almost similar and measurements related to olecranon fossa are almost similar to Somesh, M. S et al. We consider that these discrepancies could be a result of factors such as age, sex, race and also environmental factors affecting bone growth, such as nutrition, physical development and genetic factors.

Somesh, M. S et al in 2011 measure the mean value of proximal and distal segment of humerus.

Table 2: comparison of our data with those given by Sales AD et al.

Measurement	Our study Mean ± SD (cm) Right sided humerus	Left sided humerus	Study by Sales AD et al Mean ± SD (cm) Right sided humerus	Left sided humerus
D1	5.80 ± 0.40	5.72 ± 0.46	5.8 ± 0.6	5.7 ± 0.4
D2	4.07 ± 0.63	4.10 ± 0.68	4.0 ± 0.4	3.9 ± 0.4
D3	2.24 ± 0.22	2.24 ± 0.22	2.4 ± 0.3	2.4 ± 0.2
D4	5.63 ± 0.37	5.60 ± 0.45	5.8 ± 0.5	5.6 ± 0.4
D5	1.56 ± 0.18	1.56 ± 0.18	1.6 ± 0.2	1.6 ± 0.1

The distal segment of the humerus articulates with the bones of the forearm and fractures involving it may pose several

Table 3: comparison of our data with those given by Somesh, M. S et al.

Measurement	Our study Mean ± SD (cm) Right sided humerus	Left sided humerus	Study by SOMESH, et al Mean ± SD (cm) Right sided humerus	Left sided humerus
(A-B)	3.50 ± 0.30	3.70 ± 0.20	3.72 ± 0.47	3.57 ± 0.43
(C-D)	2.00 ± 0.20	2.10 ± 0.20	2.01 ± 0.34	1.90 ± 0.29
(D-E)	1.50 ± 0.20	1.60 ± 0.20	1.73 ± 0.33	1.68 ± 0. 22

reconstructive problems and complications. Therefore these fractures gain special attention for orthopedic surgeons (Jupiter & Mehne, 1992). Finally, when we assessed the distance from the proximal margin of the olecranon fossa to the distal trochlea (A-B), it was found to be 3.50 ± 0.30 & 3.70 ± 0.20 cm on right and left sided humerus and these values were much less as compared to the Turkish population (Akman et al.).

CONCLUSION:

Morphometric analysis suggests the differences between the segments of humerus within different population groups. When compared to Turkish population alone, there was an overall decrease in the mean values of all the humeral segments in Indian population. Morphometry of trochlea is very important for prosthetic sizing and designing of the distal end of humerus. This data could be used in endoprosthetic construction and in the clinical orthopaedic trauma practice in prosthetic replacement, reconstructive operations, in the area of the elbow joint. The morphometric knowledge is important since olecranon fractures occur in 10% of all upper extremity lesions.

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