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Original Research Article

MORPHOMETRIC STUDY OF SEGMENTS OF HUMERUS IN POPULATION OF BIHAR

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ABSTRACT

Background: The humerus has upper end, lower end and a cylindrical shaft. In absence of cranium, pelvis and long bones of lower limbs, estimation of living stature can be assessed by long bones such as humerus, radius and ulna. We can also find out the total length of humerus by its fragments. Morphometry of distal end of humerus is also important for determination of sex.

Materials and methods: The present study was conducted on 60 dry humerus of unknown age and sex collected from department of anatomy of Narayan Medical College and also from other medical colleges of Bihar. 6 different parameters were taken from this study.

Result: Total 60 humerus were included in this study, out of which 30 were right and 30 were left. Mean maximum length of humerus were 307.58±8.46 mm. Mean transverse and vertical diameter of head of humerus were 39.06±1.26 mm and 41.43±1.02 mm respectively. Mean distance between proximal & distal edge of olecranon fossa were 18.39±0.93 mm. Mean distance between distal edge of olecranon fossa & trochlea 15.00±0.82 mm. Mean distance between proximal edge of olecranon fossa & distal edge of trochlea were 33.39±1.32 mm.

Conclusion: The knowledge of Morphometric segments of Humerus is important to establish the length of humerus, stature, age and sex of individual and it is important for anatomists, forensic experts, archeologists. It is also helpful for orthopaedic surgeons in proximal and distal fracture of humerus and its reconstructive surgery for various implants.

KEY WORDS: Humerus segment, Morphometry, Anthropometry.

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INTRODUCTION

The humerus is the longest and strongest bone of upper extremity. It has expanded upper end, lower end and a cylindrical shaft. Upper end consist of head, neck, greater and lesser tubercle and intertubercular sulcus. Lower end consist of capitulum, trochlea, radial fossa, coronoid fossa, olecranon fossa, medial and lateral epicondyles. Intact humerus and its segments is very important for anatomists and forensic experts to investigate the identity of a skeleton. In anthropology and forensic science, morphometric analysis is carried out on remains of the long bones of the individual in absence of cranium and pelvis [1-3).

In long bones, femur and tibia collectively remains the best for assessment of living stature of the individual [4,5]. However in absence of long bones of lower limb, estimation of living stature can also be assessed by the long bones of upper limb such as humerus, radius and ulna [6,7]. When the whole length of long bones are not available, but only segment of bones is available, some methods can be

employed for usefulness of fragments of humerus [1]. We can find out the total humerus length by fragments of humerus for estimation of sex [8]. Morphometry of distal end of humerus is also important for determination of sex [9]. Mullers was the first scientist who measured the five segments of humerus by using margin of articular surfaces and key point of muscle attachment [1].

It is also important for orthopaedics surgeons in proximal and distal fracture of humerus. The measurememt of various segments of humerus is very important to provide data for various impalnts in reconstruction of various humerus fracture. The present study is conducted for morphometric study of segments of humerus.

MATERIALS AND METHODS

The present study was conducted on 60 dry humerus of unknown age and sex obtained from department of Anatomy, Narayan Medical College, Sasaram and also from other medical colleges of Bihar. Humerus were complete in all respects. Incomplete or damaged bones were excluded from the study.

Measurement of 6 different parameters were taken from this study:

1. Maximum length of humerus- it is the distance between highest point of head of humerus and most distal point of trochlea.

2. Maximum transverse diameter of head- it is the straight distance between the most lateral points on the articular surface of head.

3. Maximum vertical diameter of head- it is the straight distance between hightest and lowest points on articular surface

4. Distance between proximal and distal edge of olecranon fossa

5. Distance between distal edge of olecranon fossa and trochlea

6. Distance between proximal edge of olecranon fossa and distal edge of trochlea.

RESULTS

Total 60 humerus were included in this study, out of which 30 were right and 30 were left. Maximum length of right and left humerus were 310.96±7.08 mm and 304.20±8.49 mm respectively while the total maximum length of humerus were 307.58±8.46. Mean transverse diameter of head of humerus were 39.01±1.53 mm on right side, 39.12±0.93 mm on left side and 39.06±1.26 mm of total humerus. The mean vertical diameter of head of humerus were 41.55±1.12 mm on right side, 41.30±0.90 mm on left side and 41.43±1.02 mm of total humerus. Mean distance between proximal & distal edge of olecranon fossa were 18.36±1.08 mm on right side, 18.41±0.77 mm on left side and 18.39±0.93 mm of total humerus. Mean distance between distal edge of olecranon fossa & trochlea 15.10±0.82 mm on right side, 14.90±0.81 mm on left side and 15.00±0.82 mm of total humerus. Mean distance between proximal edge of olecranon fossa & distal edge of trochlea 33.47±1.41 mm on right side, 33.31±1.24 mm on left side and 33.39±1.32 of total humerus.

Fig. 1: Different measurement of Humerus.

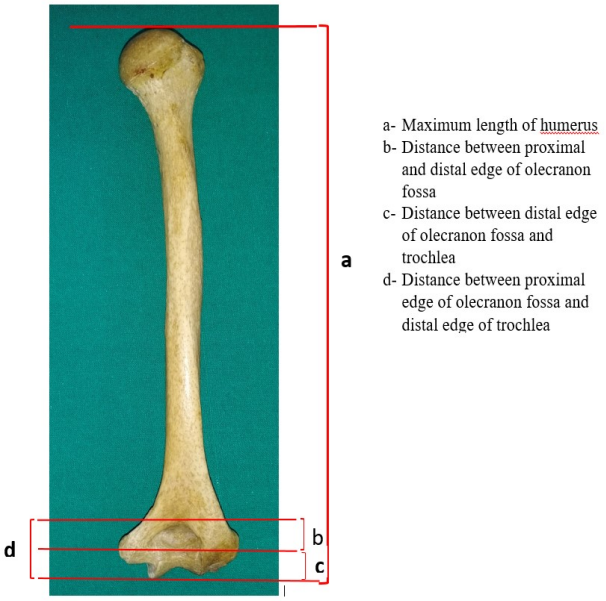

Fig.2: Measurement of Maximum transverse & vertical diameter of head of Humerus.

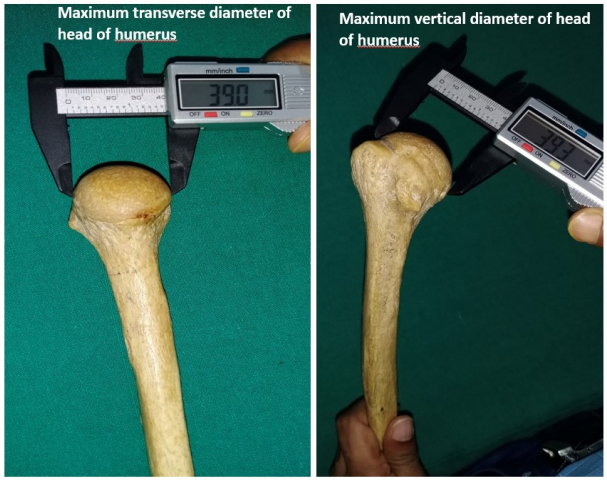

Fig.3: Measurement of olacranon fossa & trochlea.

Table. 1: Parameters of Humerus.

S.No.	Parameters (mm)	Right	Left	Total
1	Maximum length of Humerus	310.96±7.08	304.20±8.49	307.58±8.46
2	Mean transverse diameter of Head of Humerus	39.01±1.53	39.12±0.93	39.06±1.26
3	Mean vertical diameter of Head of Humerus	41.55±1.12	41.30±0.90	41.43±1.02
4	Mean distance between proximal & distal edge of olecranon fossa	18.36±1.08	18.41±0.77	18.39±0.93
5	Mean distance between distal edge of olecranon fossa & trochlea	15.10±0.82	14.90±0.81	15.00±0.82
6	Mean distance between proximal edge of olecranon fossa & distal edge of trochlea	33.47±1.41	33.31±1.24	33.39±1.32

DISCUSSION

Table 2: Showing comparison of maximum length of Humerus.

Authors	Year	Right	Left
Akman et al [11]	2006	307.1+ 20.6	304 ± 18.9
Somesh M.S et al [15]	2011	309.6+20.6	299.6 + 22.5
Present study	2019	310.96±7.08	304.20±8.49

Table 3: Showing Comparison of transverse diameter of head of Humerus.

Authors	Year	Right	Left
Pranoti et al [10]	2017	38.85 ±5.09	38.18, ±4.79
Present study	2019	39.01±1.53	39.12±0.93

The study done by Pranoti et al, the maximum transverse diameter of head of humerus was 38.85 ±5.09 mm and 38.18, ±4.79 mm on right and left side respectively where as in this study measurement was 39.01±1.53 mm and 39.12±0.93 mm on right and left side respectively.

Table 4: Showing comparison of vertical diameter of head of Humerus.

Authors	Year	Right	Left
Akman et al [11]	2006	41.0 ±5.1	40.9 ±3.9
Pranoti et al [10]	2017	42.01±4.39	40.93 ±5.14
Present study	2019	41.55±1.12	41.30±0.90

The study done by Akman et al, the maximum vertical diameter of head of humerus was 41.0 ±5.1 mm and 40.9 ±3.9 mm in right and left side respectively where as in the study done by Pranoti et al, the result was 42.01±4.39 mm and 40.93 ±5.14 mm in right and left side respectively. These results was similar to our study which was 41.55±1.12 mm and 41.30±0.90 mm in right and left side respectively.

Table 5: Showing comparision of distance between proximal & distal edge of Olecranon fossa of Humerus.

Authors	Year	Right	Left
Akman et al. [11]	2006	24.2±2.07	23.9±2.63
Premchand et al [12]	2014	17.6± 0.16	18.2 ±0.15
Berjina FN et al [13]	2018	17.7±0.15	18.2 ±0.19
Present study	2019	18.36±1.08	18.41±0.77

In this study, the mean proximal and distal edge of olecranon fossa of humerus was 18.36±1.08 mm and 18.41±0.77 mm in right and left side which was very similar to that of study done by Premchand et al and Berjina FN et al.

Table 6: Showing comparision of distance between distal edge of Olecranon fossa & trochlea.

Authors	Year	Right	Left
Wright et al. [14]	2003	17.37±3.36	16.82±2.20
Premchand et al [12]	2014	14.00±1.30	14.40 ±0.14
Present study	2019	15.10±0.82	14.90±0.81

In this study the mean distance between distal edge of olecranon fossa and trochlea was 15.10±0.82 mm and 14.90±0.81 mm in right and left side which was very close to the study done by Premchand et al.

Table 7: Showing comparision of distance between proximal edge of Olecranon fossa & distal edge of trochlea.

Authors	Year	Right	Left
Akman et al. [11]	2006	37.26 ± 4.71	35.72 ± 4.30
Somesh et al. [15]	2011	37.26 ± 4.71	35.72 ± 4.30
Premchand et al [12]	2014	31.60 ± 2.30	32.70 ± 2.50
Present study	2019	33.47 ± 1.41	33.31 ± 1.24

In this study the mean distance between proximal edge of olecranon fossa and distal edge of trochlea was 33.47 ± 1.41 mm and 33.31 ± 1.24 mm in right and left humerus respectively which was very close to study done by Premchand et al.

CONCLUSION

The knowledge of Morphometric segments of Humerus is important to establish the length of humerus, stature, age and sex of individual and it is important for anatomists, forensic experts, archeologists. It is also helpful for orthopaedic surgeons in proximal and distal fracture of humerus and its reconstructive surgery for various implants.

Conflicts of Interests: None

REFERENCES

[1]. Nath, S. & Badkur, P. Reconstruction of stature from long bone lengths. Int. J. Osteoarchaeol., 2002;1:109-14.

[2]. Beddoe, J. On the stature of the older races of England, as estimated from the long bones. J. Anthropol. Inst. Great Brit. Ireland, 1888;17:202-7.

[3]. Petersen, H. C. On the accuracy of estimating living stature from skeletal length in the grave and by linear regression. Int. J. Osteoarchaeol., 2005;15:106-14.

[4]. De Mendonça, M. C. Estimation of height from the length of long bones in a Portuguese adult population. Am. J. Phys. Anthropol., 2000;112(1):39-48.

[5]. Radoinova, D.; Tenekedjiev, K. & Yordanov, Y. Stature estimation from long bone lengths in Bulgarians. Homo 2002;52(3):221-32.

[6]. Celbis, O. & Agritmis, H. Estimation of stature and determination of sex from radial and ulnar bone lengths in a Turkish corpse sample. Forensic Sci. Int., 2006;158(2-3):135-9.

[7]. Kate, B. R. & Majumdar, R. D. Stature estimation from femur and humerus by regression and autometry. Acta Anat., 1976;94:311-20.

[8]. Munoz J.I, Linares Iglesias M, Suarez Penaranda J.M, Mayo M, Miguens X, Rodríguez Calvo M.S, Concheiro L. Stature estimation from radiographically determined long bone length in a Spanish population sample. Forensic Sci Int. 2001;46(2):363- 6.

[9]. Rogers TL. Visual method of determining the sex of skeletal remains using the distal humerus. J Forensic Sci. 1999;44(1):5760.

[10]. Sinha P, Bhutia KL, Tamang BK. Morphometric measurements of segments in dry Humerus. J. Evolution Med. Dent. Sci. 2017;6(67):4819-4822, DOI: 10.14260/Jemds/2017/1045

[11]. V.Akman SD, Karakas PM, Bozkir G. The morphometric measurements of humerus segments. Turkish Journal of Medical Sciences 2006;36:81-5.

[12]. Premchand SA and Manjappa T. Reconstruction of humeral length from measurements of its segments in South Indian population. Int J Sci Res. 2014;3(8):1956-9.

[13]. Naqshi BF, Shah, AB, Gupta S. Olecranon Fossa in Humeri of North Indian Population of Jammu- A Morphometric Study. Journal of Medical Science and Clinical Research. 2018; 6(2): 250-253.

[14]. Wright LE, Vasquez MA. Estimation of the length of incomplete long bones: forensic standards from Guatemala. Am J Phys Anthropol 2003;120(3):233-51.

[15]. Somesh M. S, Latha V, Prabhu Shilpa K, Mangala M, Ashwin Krishnamurthy B. V, Murlimanju. Morphometric Study of the Humerus Segments in Indian Population. Int. J. Morphol. 2011;29(4):1174-1180.

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