

Original Research

Morphometric Study Of Proximal End Of Humerus

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Background:- The humerus, the largest and longest bone in the upper limb, has expanded ends and a shaft. The spheroidal humeral head forms an enarthrodial articulation with the glenoid fossa. The lesser tubercle is a projection from the front of the scapula shaft near the head. It is delimited on its lateral side. The intertubercular sulcus separates the well-marked groove from the greater tubercle. The distal end is adapted to the forearm bones at the elbow joint. It carries the medial and lateral epicondyles with the articular surfaces for the radius and ulna between them.

Materials and methods:- The present study was performed on 300 dry adult humerus obtained from the Department of Anatomy at Index Medical College Department from January 2022 to April 2022.

Result:- a total of 300 dry adult humerus, we observed the length of the humerus from the highest point of the humeral head to the lowest point of Trochlea (MHL) of the left side is 290.2, and the right side is 291.02. the mean of the humeral head's transverse diameter concerning the right side's anteroposterior direction is 39.53 mm, and the left side is 36.99 mm. The mean vertical diameter of the humeral head concerning lateral-medial order on the right side is 41.63mm, and on the left side is 38.89mm; the mean of the highest point of the humeral head and greater tubercle on the right side is 7.24mm, and on the left side is 6.25mm.

Conclusion:- The knowledge of Morphometric segments of the Humerus is essential to establish the length of the humerus, stature, age, and sex of an 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.

Keywords: Humerus segment, Morphometry, Anthropometry.

Introduction

The humerus, the largest and longest bone in the upper limb, has expanded ends and a shaft. The spheroidal humeral head forms an enarthrodial articulation with the glenoid fossa. The lesser tubercle is a projection from the front of the scapula shaft near the head. It is delimited on its lateral side. The intertubercular sulcus separates the well-marked groove from the greater tubercle. The distal end is adapted to the forearm bones at the elbow joint. It carries the medial and lateral epicondyles with the articular surfaces for the radius and ulna between them. The axis between the epicondyles is the inter-epicondylar axis¹. The shaft of the human (and primate) humerus is relatively medially rotated concerning the humeral head, compared with quadrupedal ancestors; this gives the characteristically more excellent range of external rotation at the glenohumeral joint than that obtained in other species. This is reflected in the spiroidal architecture of the adult humeral medullary cavity, the arrangement and relationship of the posterior compartment of brachial muscles and the radial nerve, and the disposition to long spheroidal fractures caused by external twisting forces With the arm by the side in the anatomical position and with the medial and lateral

epicondyles in the same (frontal) plane (i.e. the inter-epicondylar axis is in the frontal plane), the humeral head is rotated posteriorly at an angle averaging 15–20° in European cadaveric specimens¹. In the anatomical position, the humerus is not rotated posteriorly about the scapula because The Glenoid Fossa, located on the scapula, faces in an anterolateral direction. It is important to remember this position of the bone when movements of the arm and forearm are considered; actions are recorded relative to the trunk (starting in the anatomical position) or close to the scapula, and it is essential to define which method is in use².

It is also essential for orthopedic surgeons in proximal and distal humerus fractures. Measuring various humerus segments is critical to provide data for multiple implants to reconstruct different humerus fractures. The present study is conducted for morphometric analysis of parts of the humerus.

Material and Method

The present study was performed on 300 dry adult humerus obtained from the Department of Anatomy at Index Medical College Department from January 2022 to April 2022.

1. **MHL (Maximum humerus length):** The distance between the humeral head's highest point and the trochlea's lowest point.
2. **TDHH (Transverse diameter of humeral head):** The diameter of the humerus head in the anteroposterior direction.
3. **VDHH (Vertical diameter of humeral head):** The diameter of the bone in the lateral-medial direction.
4. **HH-GT:** The distance between the highest point of the humeral head and the highest point of the greater tubercle.

The instruments to be used are Vernier calipers. Measurements of the humerus will be divided into three segments as measurements of the proximal epiphysis.

Result

For a total of 300 dry adult humerus, we observed the length of the humerus from the highest point of the humeral head to the lowest point of Trochlea (MHL) of the left side is 290.2, and the right side is 291.02. the mean of the humeral head's transverse diameter concerning the right side's anteroposterior direction is 39.53 mm, and the left side is 36.99 mm. The mean vertical diameter of the humeral head concerning lateral-medial order on the right side is 41.63mm, and on the left side is 38.89mm; the mean of the highest point of the humeral head and greater tubercle on the right side is 7.24mm, and on the left side is 6.25mm.



Fig No:-1 shows the measuring of the length of the humerus.



Fig. No:-2 shows the measuring transverse diameter of the humeral head.

Discussion

It is observed in this study that the mean value of maximum humerus length (HL) in the Indian population on the left side is 290.2 ± 27.8 mm, and on the right side is 291.2 ± 28.7 mm. It is comparable with Prasad NC et al³, who conducted a study in the Karnataka population, and he recorded that mean values were 302.8 ± 25.6 mm on the right side and 296.75 ± 19.6 mm on the left side. Lakshmi et al⁴ conducted a study in the South Indian population and observed mean values of 303.91 ± 19.28 mm and 306.19 ± 18.02 mm on the left and right side, respectively. According to Rahul Rai et al⁵, the adult humerus length (HL) mean values were 302.6 ± 21.4 mm and 297.5 ± 21.1 mm on the right and left sides, respectively. According to Aydin Kabakci et al⁶, in the Turkish population, the mean values of the right humerus length was 304.1 ± 17.3 mm, and that of the left was 300.4 ± 23.9 mm.

In this study, we observed that the mean values of the transverse diameter of the humeral head in the Indian population are 39.53 ± 4.83 mm on the right side and the left side, and it is compared with Aydin kabakci et al⁶, study on Turkish population as he recorded mean 38.29 ± 3.04 mm on the right side and the left side it was 38.66 ± 3.92 mm.

VERTICAL DIAMETER OF HUMERAL HEAD (VDHH)

The mean vertical diameter of the humeral head concerning lateral-medial order on the right side is 41.63mm, and on the left side is 38.89mm;

Aydin Kabakci et al⁶ observed the vertical diameter of the humeral head (VDHH) in the Turkish population. They reported mean values on the right side were 42.41 ± 3.25 mm and on the left side were 42.94 ± 4.0 mm and in our study we observed that the mean values in the Indian population on the right side is 41.63 ± 6.01 mm and on left side 38.89 ± 3.71 mm.

In our present study, we observed the mean of the highest point of the humeral head and greater tubercle on the right side is 7.24mm, and on the left side is 6.25mm.

Dr. Moumita Chatterjee et al⁷, reported that the distance between highest point of the humeral head and the highest point of the greater tubercle (HHGT) in the Eastern India population and observed that mean values are 6.30 ± 1.1 mm for the right side and 5.91 ± 1.14 mm for the left side. The present study is conducted in the Indian population, and the mean value on the left side is 6.78 ± 1.40 mm and on the right side, 7.36 ± 1.03 mm. According to Aydin Kabakci et al⁶, in the Turkish population, the mean value is 6.39 ± 1.44 mm on the right side and on the left side is 5.83 ± 1.72 mm.

Conclusion

The results of our study will be helpful to forensic, anthropometric, and archaeological investigators regarding the identification of the skeletal remains of unknown bodies by using regression equations

and also help orthopedic surgeons to place various implants for the treatment of fractures involving the humerus.

References

1. Martin, Jérémy, et al. "A New Freshwater Teleosaurid from the Jurassic of Northeastern Thailand." 2018, <https://doi.org/10.1080/02724634.2018.1549059>.
2. Gray's Anatomy 41, forty-first edition, pages 804-807
3. Prasad NC, Shivashankarappa A, Pavan P Havaladar, Shruthi BN and Shaik Hussain Saheb A study on segments of humerus and its clinical importance ISSN: 2395-1958 IJOS 2017; 3(4): 752-754 © 2017 IJOS.
4. Lakshmi Kantha.B.M *1, Roopa Kulkarni 2. estimation of total length of humerus from its fragments in South Indian population International Journal of Anatomy and Research, Int J Anat Res 2014, Vol 2(1):213-20. ISSN 2321- 4287.
5. Rahul Rai¹ and Maheshwar Chawla² morphometry of adult humerus bone in moradabad region ISSN: 2229-3809 (Online) Journal DOI:10.7439/ijbar CODEN: IJBABN IJBAR (2014) 05 (03)
6. Aydin kabakci, a. D.; buyukmumcu, m.; yilmaz, m. T.; cicekcibasi, a. E.; akın, d. & cihan, e. An osteometric study on humerus bones. Int. J. Morphol., 35(1):219-226, 2017.
7. Dr. Moumita Chatterjee,² Dr. Ratnadeep Poddar* , ³Dr. Iman Sinha,⁴ Dr. Aipta Bhattacharya , ⁵Prof. (Dr.) Asis Kumar Ghosal Segmental morphometrics and their correlation with the whole length of long bones : a study on humerus of eastern India Indian Journal of Basic and Applied Medical Research; September 2017: Vol.-6, Issue- 4, P. 363-372 Indian Journal of Basic and Applied Medical Research; September 2017: Vol.-6, Issue- 4, P. 363-372.