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Morphometric Study of Maximum Antero-Posterior and Curved Antero-Posterior Diameter of the Head of the Dry Humerus Bone

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Abstract

The humerus is a typical long bone of the upper limb; its head articulates with the glenoid cavity of the scapula to form the shoulder joint. The rounded head of the humerus is too weakly supported in the scapular glenoid cavity lined by the glenoid labrum; hence, it forms one of the most mobile and most unstable joints. Our study aims to determine the morphometry of the dry humeral head. This cross-sectional, descriptive study was carried out in the Department of Anatomy, Mymensingh Medical College, Bangladesh, from July 2021 to June 2022. We took 100 (right=43 and left=57) samples through the purposive sampling. Any damaged, unossified or fractured bones were excluded. The maximum anteroposterior diameter of the head of the humerus was measured by using digital slide calipers, while the curved anteroposterior diameter of the head was measured by using flexible measuring tape. The mean anteroposterior diameter of the head was found 38.665±3.206 mm at right side and 38.321±3.115 mm at left side. The mean curved anteroposterior diameter of the head was found 57.116±5.499 mm and 54.789±4.977 mm at right and left side respectively. Our findings are expected to be helpful for clinical anatomists, orthopedic surgeons, anthropologists, and radiologists for academic teaching and clinical decision making.

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Introduction

The humerus is the bone of the arm. It presents upper and lower ends and an intervening shaft. The upper end consists of the head, lesser and greater tubercles, the upper part of the intertubercular sulcus, and the neck.[1] The head is articular, spheroidal, and forms about one-third of the sphere. It is directed medially, backward, and upward and articulates with the glenoid cavity of the scapula to form the ball and socket shoulder (glenohumeral) joint.[1,2] The glenoid cavity is too

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shallow and less extensive for the humeral head, thus permitting a wide range of movement. The head is covered by the hyaline cartilage which is thickest at the center and thinner at the periphery.[1] The shoulder joint is the most frequently dislocated in the body. Dislocations with fractures of the upper end of the humerus are also quite common in trauma. Shoulder dislocation and deciding the proper size of the humeral component in the shoulder arthroplasty is the aim of the present study.[2] Hence, we made our goal to obtain anthropometric data of the head of the humerus, especially the maximum anteroposterior and curved anteroposterior diameter of the Bangladeshi population which will help in better understanding and management of shoulder pathologies.

Methods

This cross-sectional, descriptive type study was caried out in the Department of Anatomy, Mymensingh Medical College, Bangladesh, from July 2021 to June 2022. One hundred fully ossified dry human humerus were collected for the study (right humerus=43 and left humerus=57). A non-random, purposive sampling technique was adopted. We excluded dry bones if they were unossified, developmentally abnormal, and broken. The maximum anteroposterior diameter of the head of the humerus was measured from the anterior-most point to the posterior-most point at the widest part of the head of the humerus by using a digital slide calipers (Fig. 1). The curved anteroposterior diameter of the head of the humerus was measured from the most anterior point to the most posterior point at the widest part of the head of the humerus by using flexible measuring tape (Fig. 2). All measurements were expressed in mm.

Fig. 1: Photograph showing measurement of maximum antero-posterior diameter of the head of the humerus

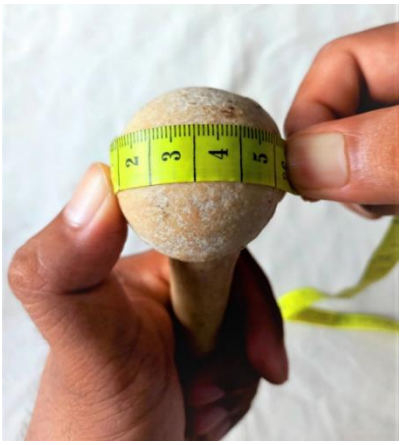

Fig. 2: Photograph showing measurement of curved antero-posterior diameter of the head of the humerus

Results

The maximum anteroposterior diameter of the head of the 43 right humeri ranged from 33.10 mm to 44.97 mm. More than 76% of samples were measured within the range of 35.00 mm to 42.50 mm. The maximum anteroposterior diameter of the head of the 57 left humeri ranged from 32.68 mm to 44.90 mm. More than 75% of samples were measured within the range of 35.00 mm to 42.50 mm. The mean anteroposterior diameter of the head was found 38.665±3.206 mm at right side and 38.321±3.115 mm at left side. (Fig. 3)

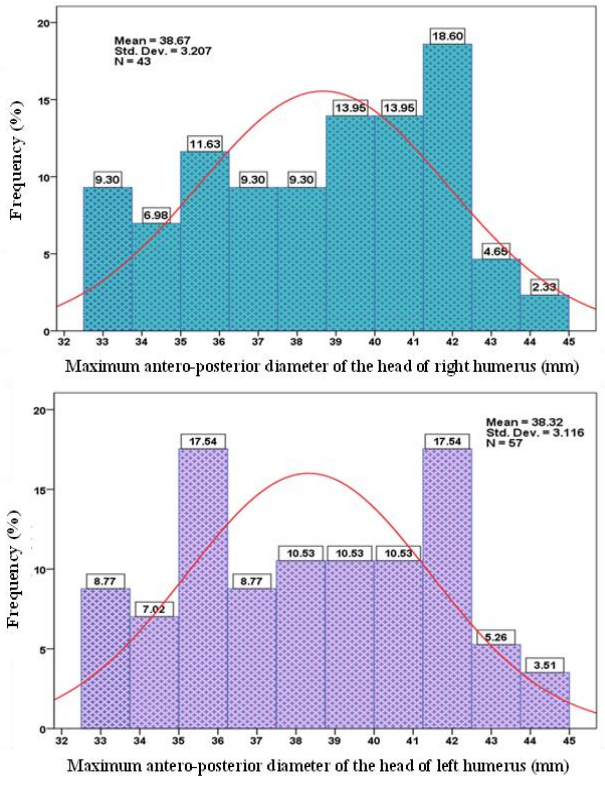

Fig. 3: Histogram showing the frequency distribution of maximum antero-posterior diameter of the head on both sided humerus

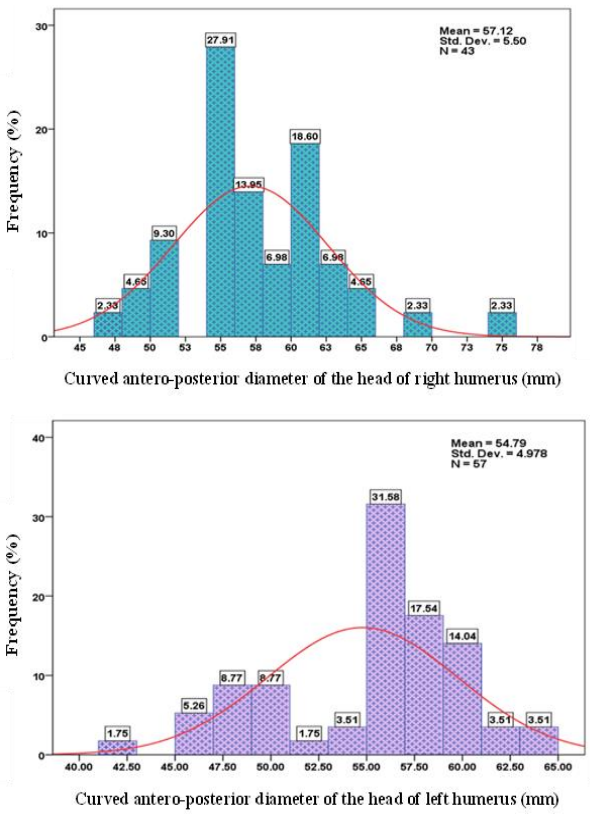

Fig. 4: Histogram showing the frequency distribution of curved antero-posterior diameter of the head on both sided humerus

The curved anteroposterior diameter of the head of the 43 right humeri ranged from 47 mm to 75 mm. More than 79% of samples were measured within the range of 52.00 mm to 66.00 mm. The curved anteroposterior diameter of the head of the 57 left humeri ranged from 42 mm to 63 mm. More than 80% of samples were measured within the range of 49.00 mm to 63.00 mm. The mean curved anteroposterior diameter of the head was found 57.116±5.499 mm and 54.789±4.977 mm at right and left side respectively (Fig. 4).

Discussion

In the present study, the mean (±SD) maximum anteroposterior diameter of the head of the right humerus was 38.665 (±3.206) mm and the left humerus was 38.321 (±3.115) mm. The mean value of right-sided humeri in the present study was nearly similar to the value described by the Paul *et al*., Udhaya, Devi & Sridhar, Salles *et al.,* Kabakci *et al.,* Kumari, Subhash & Sinha, Sinha *et al.,* Sinha, Bhutia & Tamang, Naqshi *et al.* and Jahan & Srivastava, as reported 38.27 (±3.05) mm, 37.52 (±3.42) mm, 40.00 (±4.00) mm, 38.29 (±3.04) mm, 36.91 (±6.12) mm, 39.01 (±1.53) mm, 38.8524 (±5.09) mm, 39.20 (±3.10) mm and 39.53 (±4.83) mm respectively.[3-11] However, our value was higher than the value described by Gayatri *et al.* as they found 27.80 (±2.85) mm.[12] The mean value of left-sided humeri in the present study was nearly similar to the value described by Paul *et al.,* Salles *et al*., Kabakci *et*

al., Kumari, Subhash & Sinha, Sinha *et al.,* Sinha, Bhutia & Tamang, Naqshi *et al.* and Jahan & Srivastava as they observed 37.91 (±2.70) mm, 39.00 (±3.00) mm, 38.66 (±3.92) mm, 39.21 (±5.81) mm, 39.12 (±0.93) mm, 38.1825 (±4.786) mm, 38.40 (±3.50) mm and 36.99 (±3.11) mm respectively.[3,5-11] However, our value was higher than the value described by Gayatri *et al*. as they found 25.90 (±2.65) mm.[12] Moreover, our value was lower than that of described by Udhaya, Devi & Sridhar as they found 41.03 (±3.39) mm.[4] In the present study, the mean (± SD) curved anteroposterior diameter of the head of the right humerus was found 57.116 (±5.499) mm and of the left humerus was 54.789 (±4.977) mm. However, no previous reports analyzing the curved anteroposterior diameter of the head of the humerus were available to compare to the findings of our study.

Conclusion

The morphometric study plays a crucial role in forensics, anatomy, and archaeology. These studies are instrumental in identifying unknown bodies and determining the stature of individuals within the Bangladeshi population. Additionally, they aid orthopedic surgeons in treating fractures of the humerus and facilitating their reconstruction. These measurements are invaluable for prosthesis manufacturing units and authorities, as they enable the design of prostheses that account for racial and ethnic variations. Furthermore, these data facilitate correlations with radiological information, paving the way for the development of effective techniques for prosthesis remodeling.

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