



Morphometric Study of Proximal End of Humerus in North Indian Population

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Abstract

Background: Many orthopaedic treatments need a proper measurement of bone and morphometric analysis of bone also very useful in forensic anthropology and many more fields. Morphometric studied data also help in reconstruction of bone and a proper surgical planning.

Objectives: To determine the dimension of proximal end of humerus

Material and Methods: Thirty humerus were taken without know sex. HL (Humerus length): The distance between the highest point of the humeral head and the lowest point of the trochlea. TDHH (Transverse diameter of humeral head): The diameter of the humerus head in the antero-posterior direction. VDHH (Vertical diameter of humeral head): The diameter of the bone in the lateral-medial direction. HH GT (Highest Point of Humeral Head and Greater Tubercle): The distance between the highest point of the humeral head and the highest point of the greater tubercle.

Results: The mean length of humerus on left side is 290.2 and 291.02 on right side. The mean of the transverse diameter of humeral head is 39.53 mm and left side is 36.99 m. The mean vertical diameter of humeral head with respect to lateral-medial direction on right side is 41.63mm and on the left side is 38.89mm. The mean of highest point of humeral head and greater tubercle on right side is 7.24mm and on the left side is 6.25mm

Keywords: Head of humerus, Humerus, Humerus proximal end.

Introduction

The humerus is longest and largest bone of the upper limb. It has expanded ends and a shaft. The upper end comprises of rounded head, the proximal and medial part of the upper end of the bone and forms an enarthrodial articulation with the glenoid cavity of the scapula. The lesser tubercle projects from the front of the shaft close

to the head and is limited on its lateral side by a well marked bicipital groove. The distal end loosely termed condylar is adapted to the forearm bones at the elbow joint. The capsular ligament of the elbow joint is attached anteriorly to the upper limits of the radial and coronoid fossae so that both these bony depressions are intracapsular and therefore lined with synovial membrane. The

lesser tubercle projects from the front of the shaft close to the head and is limited on its lateral side by a well-marked bicipital groove.

The proximal segment of the humerus consists of the head, anatomical neck and greater and lesser tubercles. The head of the humerus forms rather less than half a spheroid. Its smooth articular surface is covered with hyaline cartilages, which is thicker centrally. When the arm is at rest by the side it is directed medially, backwards and upwards to articulate with glenoid cavity of scapula.¹ the morphometric segments of humerus very help for anthropologist, anatomists and in forensic for identification of skeleton.² Clinically the proximal and distal humerus fracture are commonly in elderly people.³ Some common fracture are Avulsion fracture in greater tubercle, sometime dislocation also cause fracture in proximal end of humerus.⁴

Material and Methods

Study Population: The study was carried out on thirty dry adult humerus with unknown gender collected from Department of Anatomy, Rama Medical College Manadhana Kanpur over a period of six-month July 2018 to December 2018.

Methods

The different parameters of each humerus were measured by with the help of Digital Vernier calipers.

Measurements to be determined are as follows:

1. HL (Humerus length): The distance between the highest point of the humeral head and the lowest point of the trochlea.

2. TDHH (Transverse diameter of humeral head): The diameter of the humerus head in the antero-posterior direction.
3. VDHH (Vertical diameter of humeral head): The diameter of the bone in the lateral-medial direction.
4. HH GT (Highest Point of Humeral Head and Greater Tubercle): The distance between the highest point of the humeral head and the highest point of the greater tubercle.

Inclusion Criteria: Complete unbreakable Humerus.

Exclusion Criteria: Broken Humerus.

Statistical Analysis: Statistical analysis was performed by using computer-based software, Statistical Package for Social Science (SPSS). Mean values of parameters were compared to determine.

Result

In the present study, the mean length of humerus on left side is 290.2 and 291.02 on right side. Show in Table No. 1. The mean of the transverse diameter of humeral head is 39.53 mm and left side is 36.99 mm show in the table No 2. The mean vertical diameter of humeral head with respect to lateral-medial direction (VDHH) on right side is 41.63mm and on the left side is 38.89mm show in table no 3. The mean of highest point of humeral head and greater tubercle on right side is 7.24mm and on the left side is 6.25mm shown in Table No.4.

Table 1 Distribution of mean height of humerus

Left side			Right side		
Mean	Std. Deviation	Std. Error Mean	Mean	Std. Deviation	Std. Error Mean
290.2 mm	27.8mm	71mm	291.2 mm	28.7 mm	74 mm



Fig. 1 Showing measurement of length humerus

Table 2 Mean value of transverse diameter humeral head

LEFT TDHH			RIGHT TDHH		
Mean	Std. Deviation	Std. Error Mean	Mean	Std. Deviation	Std. Error Mean
36.99 mm	3.11 mm	0.84 mm	39.53mm	4.83 mm	1.24 mm

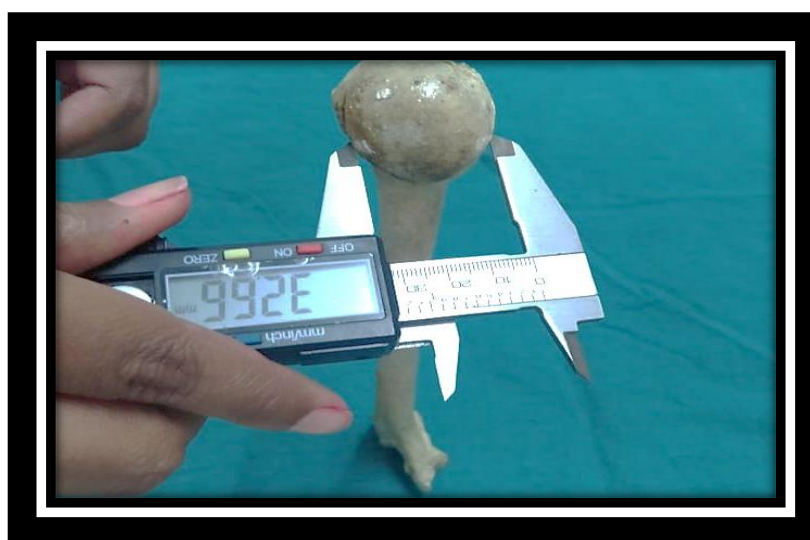


Fig. 2 showing measurement of transverse diameter humeral head

Table 3 Distribution of mean vertical diameter of humeral head

LEFT VDHH			RIGHT VDHH		
Mean	Std. Deviation	Std. Error Mean	Mean	Std. Deviation	Std. Error Mean
38.89mm	3.71 mm	0.95 mm	41.63 mm	1.55 mm	0.95 mm

Table 4 Distribution of mean of highest point of humeral head and greater tubercle

LEFT HHGT			RIGHT HHGT		
Mean	Std. Deviation	Std. Error Mean	Mean	Std. Deviation	Std. Error Mean
6.26 mm	1.25 mm	0.32 mm	7.24mm	2.09mm	0.54mm

Discussion

Humerus Length (HL)

In our present study we found mean value of humerus length (MHL) in North Indian population on left side is 290.2 ± 27.8 mm and on right side is 291.2 ± 28.7 mm. while comparing our study with Prasad NC et al⁵, Lakshmi et al.⁶, Rahul Rai et al.⁷, and Aydin Kabakci.⁸ et al whose finding value was 302.8 ± 25.6 mm on right side and 296.75 ± 19.6 mm on left side, 303.91 ± 19.28 mm and 306.19 ± 18.02 mm on the left and right side respectively, 302.6 ± 21.4 mm & 297.5 ± 21.1 mm on the right and left side respectively. 304.1 ± 17.3 mm right and 300.4 ± 23.9 mm was left and this value was similar with our study.

Transverse Diameter of Humeral Head (TDHH)

In our current study we found mean values of transverse diameter of humeral head (TDHH) in North Indian population it is 39.53 ± 4.83 mm on right side and on the left side it is 36.99 ± 3.11 mm. while comparing our study with Aydin Kabakci et al⁸ recorded 38.29 ± 3.04 mm on right side and on the left side it was 38.66 ± 3.92 mm which was similar with our study while comparing with Moumita Chatterjee et al⁹ there finding was 45.73 on right side and 45.35 left side these value was very high as compare with our value.

Vertical Diameter of Humeral Head (VDHH)

In our current study we observed that the mean values of vertical diameter of humeral head on the right side is 41.63 ± 6.01 mm and on left side 38.89 ± 3.71 mm. while comparing our study with Aydin Kabakci et al⁸. There mean values on the right side were 42.41 ± 3.25 mm and on the left side were 42.94 ± 4.0 mm and these value was almost similar with our finding.

HHGT (Highest Point of Humeral Head and Greater Tubercle)

In our current study we found HHGT the mean value on the left side is 6.78 ± 1.40 mm and on right side 7.36 ± 1.03 mm. similar study was performed by Moumita Chatterjee et al⁸, and Aydin Kabakci et al⁹ there mean value was 6.30 ± 1.1 mm for the right side and 5.91 ± 1.14 mm for

the left side, and 6.39 ± 1.44 mm on the right side and on the left side is 5.83 ± 1.72 mm. Which was similar with our study.

Conclusion

Morphometric study is very helpful in forensic, anatomic and archaeological. These study help in cases in identification of unknown bodies and to determine stature of the individual in our population and as well as for the orthopaedic surgeons for the treatment of proximal humerus fractures and for their reconstruction. These measurements play an important role in prosthesis manufacturing units or authorities, in designing the same on basis of racial and ethnic variations. These data help in further correlation with radiological data and formulate new techniques for effective remodelling of the prosthesis.

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