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Morphological and morphometric study on bicipital groove of humerus in eastern Indian population

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Abstract
Aim: To study the morphology and morphometry of bicipital groove of dry humerus in eastern Indian population.
Material and Methods: 86 dry adult humeri were investigated. The Bicipital Groove of Humerus was noted for morphological and morphometric variations in terms of length of medial and lateral wall, width and depth by using Digital Vernier Calliper and also for presence of Supra Tubercular ridge of Meyer.
Result: Morphometric measurement of the bicipital groove were carried out of 86 humeri (49 right and 37 left side). The mean maximum length of humerus was 31.142±2.41cm.The mean length of medial and lateral wall of bicipital groove on right side was 23.98±1.05mm and 32 .15±2.15mm respectively and on left side was 23.13±2.46mm and 31.95±0.28mm respectively. The mean length of right side bicipital groove was 83.93±5.68mm and on left side was 86.59±6.28mm. The mean width of bicipital groove on right and left side was 6.79±0.53mm and 7.56±1.05mm respectively. The mean depth of bicipital groove on right side was 4.17±0.56mm and on left side 5.01±1.02mm. A Supra Tubercular ridge of Meyer was present in 29(33.7%) out of 86 humeri of which 18 were present on the right side.

Keywords: morphology, morphometry, bicipital groove, dry humerus

Introduction

The intertubercular sulcus or bicipital groove is situated in the proximal part of humerus between greater and lesser tubercles and it is continues distally for about 5cm on the shaft.

It lodges the long head of biceps brachii tendon along with its synovial sheath between the tendon of Pectoralis major and tendon of teres major on its lateral and medial lip respectively. It also transmit an ascending branch of the anterior circumflex humeral artery. Lesser and greater tubercle is bridge by a broad band transverse humeral ligament which convert sulcus into a tunnel and acts as a retinaculum to provide stability and effective functioning of long head of biceps brachii muscle and prevent subluxation of tendon during multidirectional biomechanical movements of the arm. Coracohumeral ligament directly overlies the transverse humeral ligament and continues with rotator cuff.

The Supra Tubercular ridge is a bony prominence that continues with the lesser tubercle was defined by cone as "a bony ridge extending proximally from the lesser tuberosity more than one half of the distance to the humeral head". Supra Tubercular ridge originally described by Meyer in 1928 and later by Hitchock and Bechtol in 1948. Presence of Supra Tubercular ridge gradually allow to change in direction of tendon of long head of biceps towards laterally. Bicipital groove and proximal part of tendon of long head of biceps disorders are becoming recognised as an important symptom. Abnormalities includes tenosynovitis, pulley lesions, biceps dislocation, proximal tears etc. Bicipital groove is an important landmark for replacement of prosthesis of shoulder and knowledge of its morphology is of great importance for selection of prosthetic design. Present study, the morphologic and morphometric of bicipital groove was investigated in relation to its length, width, length of lateral and medial wall and presence of Supra Tubercular ridge of Meyer in Eastern Indian population.

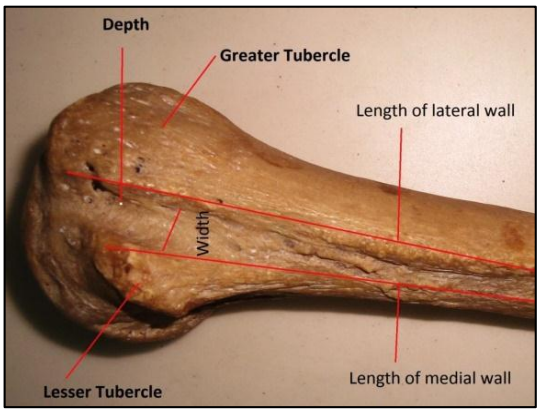

Fig 1

Fig 2

Materials and methods

This study was focused in the morphological variations in 86 dry adult humeri (49 right and 37 left side) obtained from the Department of Anatomy, Mahatma Gandhi Memorial Medical College, Jamshedpur, East- Singbhum district of Jharkhand state, between October 2016 and February 2017 . These bones were unpaired. Humeri with external deformities were excluded from the study. The bicipital

groove of each bone was thoroughly examined and parameters included length, width, depth using digital vernier calliper. The length of bicipital groove was measured as from the point between the greater and lesser tubercle maximum vertical distance upto end of medial lip of bicipital groove. The width was measured as the any point of maximum width of bicipital groove. The depth was measured between the distance of floor to the greater and lesser tubercles. The length of medial and lateral wall measured from the respective tubercles to their lips of bicipital groove. The data was recorded separately for right and left humeri and were presented in Mean±SD. Statistical analysis between the sides was performed with P-values <0.05 statistical significance.

Results

Morphometric measurement of the bicipital groove were carried out of 86 humeri (49 right and 37 left side). The mean maximum length of humerus was 31.142±2.41cm.The mean length of medial and lateral wall of bicipital groove on right side was 23.98±1.05mm and 32.15±2.15mm respectively and on left side was 23.13±2.46mm and 31.95±0.28mm respectively. The mean length of right side bicipital groove was 83.93±5.68mm and on left side was 86.59±6.28mm.

The mean width of bicipital groove on right and left side was 6.79±0.53mm and 7.56±1.05mm respectively. The mean depth of bicipital groove on right side was 4.17±0.56mm and on left side 5.01±1.02mm. A Supra Tubercular ridge of Meyer was present in 29(33.7%) out of 86 humeri of which 18 were present on the right side. Table 1 shows the data analysed between the sides.

Table 1: Morphometric measurement of bicipital groove

Bicipital Groove	Right side	Left side
Length	83.93±5.68mm	86.59±6.28mm
Width	6.79±0.53mm	7.56±1.05mm
Depth	4.17±0.56mm	5.01±1.02mm
Length of medial wall	23.98±1.05mm	23.13±2.46mm
Length of lateral wall	32.15±2.15mm	31.95±0.28mm

Discussion

Bicipital groove is described in many of the anatomy and orthopaedic textbooks, the morphometric data on bicipital groove is scarce. Very few studies have been carried out on bicipital groove in various parts of the world. The bicipital groove length and width are of great important factor in preventing subluxation and dislocation of tendon. In a shallow groove thick tendon have tendency to dislocate. On other hand narrow groove will have the tendancy to constrict the tendon leading to impingement syndrome. Rajani S *et al.*, conclusively reported the length of medial and lateral walls of bicipital groove. The length of medial and lateral wall of bicipital groove on right side was 23±4mm and 31±6mm and for left side the length of medial and lateral wall was 24±5mm and 31±5mm which is near to present study.

Table 2: Comparative study of bicipital groove (Length, Width, Depth)

Author	Length		Width		Depth	
Abboud *et al.*	-		-		5.1	
Vettival *et al.*	-		10.23		3.7	
Levinsohn	-		7		5	
Cone *et al.*	-		8.8		4.3	
Wafae *et al.*	81		10.1		4.3	
Murlimanju *et al.*	**Right**	**Left**	**Right**	**Left**	**Right**	**Left**
	86±10.1	83.3±11.5	8.3±2.4	8.7±2.2	4.7±2.0	4.2±1.6
Rajani S *et al.*	85±09	83±10.1	9.0±2.1	8.9±1.1	5.0±1.0	6.0±1.0
Present study	83.93±5.68	86.59±6.28	6.79±0.53	7.56±1.05	4.17±0.56	5.01±1.02

Measurement in mm.

The morphometric knowledge of bicipital groove is a subject of clinical interest. Anatomic variations in bicipital groove may give rise to sliding of the tendon of long head of Biceps brachii. The length of bicipital groove is similar to the results of Wafae *et al.* In Indian population reported by Murlimanju *et al.* was length of bicipital groove on the right and left side is 86±10.1mm and 83.3±11.5mm respectively. The width of bicipital groove in the present study is lower to that of Murlimanju and Cone *et al.* The depth of bicipital groove is 4.17±0.56mm on right side and 5.01±1.02mm in our study which coincides with Abboud *et al.* and Wafae et at but higher than the results of Vettival *et al.*; and lower than that of Rajani . The depth of bicipital groove is more on the left humeri than the right humeri in our study which is same as the findings of Rajani. Lengths of the medial wall and lateral walls of bicipital groove are 23.98±1.05mm and 32.15±2.15mm on right side and 23.13±2.46mm and 31.95±0.28mm on left side respectively which is nearer to the results of Rajani S *et al.* The Supra Tubercular ridge is found in 33.7% of the humeri out of 86 of which 20.93% is on right side and 12.79% on left side. In the studies of Hitchcock and Bechtol, demonstrated the significant correlation between the supratrochlear ridge and tendonitis. Cone and his colleagues observed this in 50% of the patient's radiographs but they opined that it was not pathologically significant. Vettivel *et al.* found this ridge in 88% of right humeri and 57% of left humeri and concluded that this ridge is more necessary on the right side to avoid the medial displacement of tendon of long head of biceps brachii from the bicipital groove. Vettivel *et al.*, found this ridge in 88% on the right side and 57% on the left side. Murlimanju *et al.*, reported Supra Tubercular ridge in 24(23.1%) of the humeri of which 16(15.4%) were on the right side. In our study we found 20.93% on right side and 12.79% on left side. This may be due to race related and demographic variation.

Conclusion

The present study is an attempt to determine the morphology and morphometry of bicipital groove of humerus of Eastern Indian population. The finding would pave way for better understanding of morphological and functional aspect of bicipital groove and may be useful in planning for orthopaedic surgeries in proximal end of humerus.

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