

Trochlear sulcus angle and capitello-trochlear angle

Shrestha A¹ Chalise P²

¹Dept. of Orthopaedics. Chitwan Medical College, Bharatpur.

²Dept. of Orthopaedics. Nepal Medical College, Kathmandu.

ABSTRACT

Introduction: Displaced intra-articular fracture of distal humerus is difficult to evaluate without parameters.

Methods: Two angular measurements named as trochlear sulcus angle and capitello-trochlear angle are identified in distal humerus articular surface and their normal values are measured in elbow radiograph of fifty volunteers. Their initial values are reported in both male and female elbow and their significance during restoration of normal alignment is discussed.

Result: Average TS angle is 138.71 and average CT angle is 145.28. In between male and female, the difference between TS measurement is 1.73 and CT angle is 1.08 (figure 4). So, female elbow is more valgus in bony anatomy.

Conclusion: Analysis of TS angle and CT angle is reported. This is the first report to elaborate the distal humerus articular configuration. Its clinical application will substantiate its significance.

Key words: Intra articular fracture, distal humerus, trochlear sulcus angle

INTRODUCTION

The significance of Baumann's angle is well known in fracture of distal humerus in immature bone¹ and there is no such parameter used to evaluate the fracture of distal humerus in mature bone. In adult, intra-articular fracture displacement or reduction of distal humerus is generally evaluated by observing the alignment of articular surface in trochlea and capitellum. So, in situations where there is loss of articular fragments, the reconstruction of articular

surface needs some parameters to be addressed.

We have identified two measurements in distal humerus, named as trochlear sulcus angle (TS angle) and capitello-trochlear angle (CT angle) for this purpose.

Correspondance:

Dr Arjun Shrestha MS, PhD,
Professor, Dept. of orthopaedics. chitwan
medical college, bharatpur
Email: arjun_ortho@yahoo.com

Through the radiographic study of elbow in normal volunteers, we have attempted

to define them and reported initial values of their measurements. During

reconstruction of intra-articular fracture of distal humerus, these two measurements will help to recover the anatomical alignment of articular surface.

MATERIAL AND METHOD

Fifty volunteers (25 male and 25 female, age ranging 19 to 42 years) were selected for x-ray photograph of elbow, either right or left side for anterior posterior view in full extension. Trochlear sulcus angle was measured as angle in between the lateral and medial slopes of articular surface of trochlea. And capitello-trochlear angle was identified as angle in between the medial slope of articular surface of trochlea and the line that joins the apex of trochlear sulcus and the most distal part of capitellum which generally coincides with the point just above middle of articular surface of radial head (Figure1, figure2).

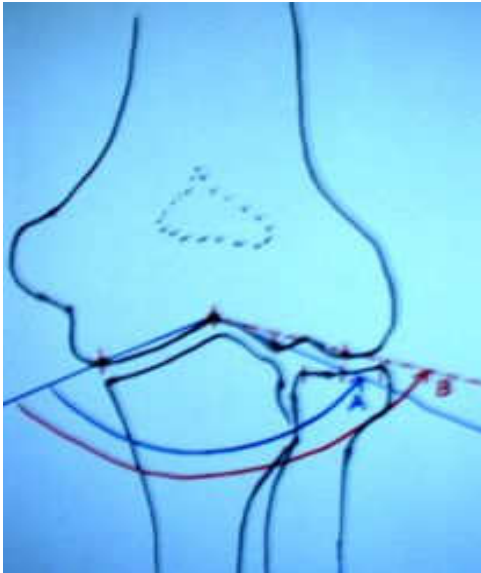


Figure 1

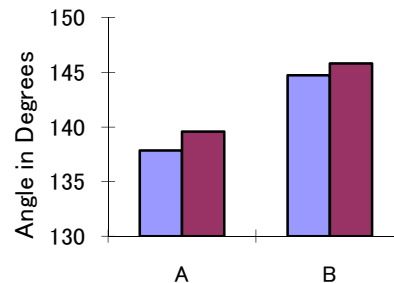


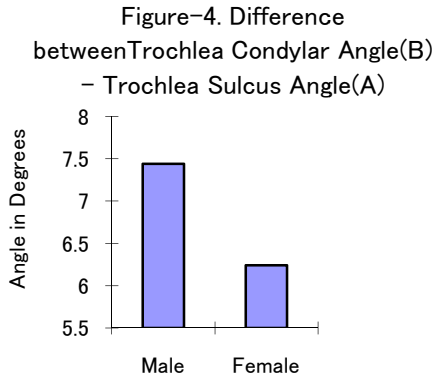
Figure 2

RESULT

In all 50 roentogen plates, measurement lines were drawn according to methods explained above. Angles were measured in each plate and collected for average value in Excel software. Average TS angle is 138.71 and average CT angle is 145.28 (figure3). Furthermore, these two angles are not equal in male and female elbows. In between male and female, the difference between TS measurement is 1.73 and CT angle is 1.08 (figure 4). So, female elbow is more valgus in bony anatomy.

Figure-3.A:Trochlea sulcus angle
B:Trochlea Condylar Angle





DISCUSSION

Intra-articular fractures of distal humerus frequently results from high energy trauma and may be extensively comminuted². In road traffic accidents, comminuted condylar fractures are more common. In these cases, adequate functional recovery of injured elbow is a challenge to an orthopaedic surgeon due to articular involvement and soft tissue contracture around the elbow due to prolonged immobilization¹. If sufficient stability to permit early range of motion can not be achieved, then anatomic restoration of the articular surface should take the precedence³. To reconstruct normal joint alignment, anatomical reduction of condyles is pre-requisite. In comminuted trochlea damage, bony or cartilage gap may need grafting. In such cases, TS angle and CT angle should be considered.

In bony anatomy, the distal humerus consists of an obliquely oriented articular surface consisting of the spool like trochlea and the hemispheric capitellum, each supported by a condylar column. The olecranon fossa lies between these columns proximal to the articular surface. The longitudinal axis of the spool-shaped trochlea is internally rotated 3 to 8 degrees with respect to the

humerus and inclines laterally 5 to 8 degrees². The medial ridge is more prominent than the lateral ridge, so central groove is directed slightly laterally producing carrying angle of the elbow³. Here average TS angle is 138.71 and average CT is 145.28, furthermore it is shown by the data that female elbow is more valgus in comparison to male elbow and this phenomenon is in accordance with normal variance of carrying angle between male and female. We have defined intra-articular angles in quantitative form which will certainly predict more reliable and scientific applied anatomy.

Elbow joint comprises of ulno-humeral and radio-humeral joint. TS angle explains the alignment of ulno-humerus joint and CT angle explains the radio-humeral joint. So, both angles are essential to take into consideration because cubitus valgus may occur after alteration of only CT angle without disturbing TS angle as we see in malunion of lateral condyle fracture. Inadequate reduction of intercondylar fracture can alter both CT and TS angle causing deformity of elbow.

This study focus mainly on normal values of TS and CT angle, however practical application of these two measurements will further prove its utility. This is the first report of its kind in measurement of angles of trochlea and capitellum with its clinical significance. So, further research work will be needed to elaborate the operative applications during reconstruction of distal humerus articular surface.

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