

DETERMINING THE RESTING POSITION OF THE GLENOHUMERAL JOINT IN NORMAL SUBJECTS

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INTRODUCTION

The resting position is generally regarded as the position of a joint in which the joint tissues are under least amount of stress and where the joint capsule has its great laxity. It is frequently chosen as the ideal position for evaluation and early treatment of painful and inflammatory joint or joint with hypomobility [1]. For glenohumeral (GH) joint, according to the data in cadaver study reported by Hsu, the resting position was located at an average position of 39 degree of abduction in the scapular plane [1]. However, as far as we know, no research has determined the resting position of GH joint in vivo model. Therefore, the purpose of this study is to define the resting position of the GH joint by investigating the total displacements of humeral head and total rotation range of motion (ROM) of the GH joint at each GH abduction angle in normal subjects.

METHODS

Seventeen normal subjects were recruited. All subjects were seated on the sturdy chair with a designed clamp grapping the spine of the scapula and clavicle. The lateral border of the scapula was also blocked. One adjustable lower arm brace was put on the elbow to immobilize it at 90° flexion. The center of rotation (COR) of GH joint was estimated with the modified methods [2]. The constant relationship between the markers of Fastrack tracking device and COR within local coordinate system were then established.

For measuring the displacements of humeral head, an 80 N force was applied during anterior-posterior (A-P) glide and posterior-anterior (P-A) glide and the markers will be tracked. The displacement of COR could be computed according to the constant relationship. A torque transducer was used during rotation ROM of GH joint to ensure a consistent torque of 4 Nm of internal rotation (IR) moment and external rotation (ER) moment. The markers were tracked during joint play movement and rotation ROM in the plane of scapula from neutral position to end range of GH abduction at 10 degree intervals. Three repeated displacements of COR and rotation ROMs were computed.

All three replicates of displacement measurements and the rotation measurements were used for data analysis. Intra-class correlation coefficient was used to test the Intraclass reliability of the displacements of humeral head and rotation ROMs. To determine the resting position, the method employed by Hsu et al. was followed [2].

RESULTS AND DISCUSSION

Intrarater reliability, ICC(2,1) values, were depicted in Table1. The average values of A-P, P-A displacements, IR and ER ROMs were shown in figure 1 and figure2.

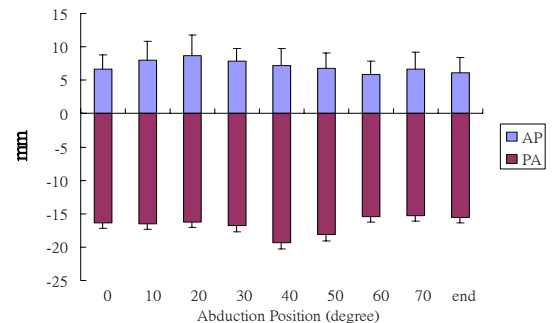


Figure 1: The average values of A-P and P-A displacements at multiple GH joint abduction angles.

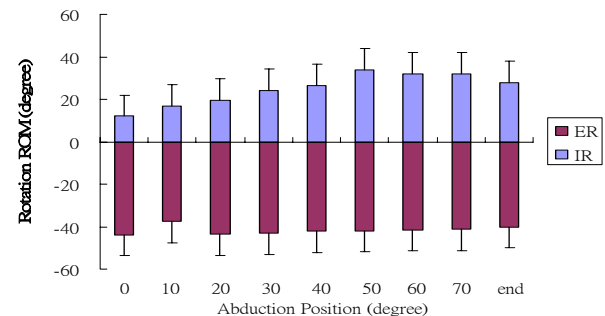


Figure 2: The average values of IR-ER ROMs at multiple GH joint abduction angles.

The resting position is defined as the midpoint of the shared range of 95% confidence intervals of the predicted abduction angles where peaks of maximal displacement and rotation occurred in this study. It provides fundamental information to the practice of orthopedic manual procedures in physical therapy.

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2. Gamage SSHU, Lasenby J. New least squares solutions for estimating the average center of rotation and axis of rotation. *J Biomech* **35**, 87-93, 2002.

Table 1: Intraclass Correlation Coefficient among three replicates of A-P, P-A, IR, ER measurement.

	A-P	P-A	IR	ER
ICC(2,1)	0.719-0.936	0.759-0.97	0.807 - 0.979	0.945-0.993