Analysis of glenohumeral kinematics in normal shoulder using open channel MR system

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Purpose

The purpose of this study was to define biplanar glenohumeral kinematics in the normal shoulder.

Methods

From a total of 10 subjects including 5 men and 5 women whose average age was 27 years showing no abnormal finding on ultrasonography and physical examination, coronal and axial images were obtained using open MR system (AIRIS®, HITACHI). The subjects were in the supine position with the shoulder joint in the neutral position, 90 ° abduction-external rotation, 90 ° abduction, and at 90 ° abduction-internal rotation position. Using the auto CAD® 2005 program, the images were examined to evaluate the relationship (distance) between the motion center of the glenoid and humeral head.

Results

When the normal shoulder was in the neutral position, the motion center of the humeral head in respect to the glenoid center was located 0.94±0.81 mm inferiorly in the coronal plane and 1.29±1.23 mm posteriorly in the axial plane. In the 90 ° abduction-external rotation position, it was 0.34±1.25 mm inferiorly in the coronal plane and 2.37±0.74 mm posteriorly in the axial plane. In the 90 ° abduction position, it was 0.33±1.13 mm inferiorly in the coronal plane and 0.52±0.60 mm posteriorly in the axial plane. In the 90 ° abduction-internal rotation position, it was 0.50±0.94 mm inferiorly in the coronal plane and 0.97±0.60 mm posteriorly in the axial plane. No significant difference was present between men and women.

Conclusion

In the normal shoulder, the relationship between the motion center of the humeral head and the motion center of the glenoid varied more in the coronal plane compare with the axial plane. In respect to the motion center of the glenoid, the motion center of the humeral head in the normal shoulder was located slightly posteroinferiorly in the neutral position and moved anterosuperiorly in the 90 ° abduction position. In 90 ° abduction-external rotation position, humeral were located posterosuperiorly than neutral position. As the shoulder moved toward 90 °

abduction, it moved anterioly and the shoulder moved toward 90° abduction-internal rotation, it moved posteroinferiorly, which was anteriorsuperior compared with when the shoulder was in the neutral position. The results were obtained with the subjects in the supine position so that actual data would be somewhat different when people carry out daily life in the standing position.