

In Vivo Three-dimensional Evaluation of the Functional Length of Glenohumeral Ligaments

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The acromioclavicular-hook-plate is one of the surgical treatments for distal clavicle fracture and traumatic acromioclavicular (AC) joint dislocation. Although this procedure can obtain rigid and accurate anatomical reduction of the AC joint, secondary widening of the hook-hole in the acromion is often seen during postoperative follow-up. This complication is owing to the high-degree of mobility of the AC joint. Therefore, it is important to evaluate the effect on these complications due to the position of the hook-hole. The purpose of the present study is to investigate three-dimensionally the effect due to the position of the hook-hole during arm abduction motion. We studied in vivo and three-dimensional kinematics of the normal shoulder joint with use of a markerless bone-registration technique. Magnetic resonance images of 14 shoulders of 7 healthy volunteers were acquired in 7 positions between 0° and 180° of abduction. We created three-dimensional computer models of the bones and the acromioclavicular-hook-plate. Based on the three-dimensional kinematics data, we simulated the widening of the hook-hole each different positioning of the hook-hole. The widths of the hook-holes almost linearly increased. And these widths significantly increased, when we put the hook-hole on the acromion from AC joint to 20 mm and 25 mm posterior position.