

## In Vivo Three-Dimensional Evaluation of the Functional Length of Glenohumeral Ligaments

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Glenohumeral ligaments play an important role in stabilizing the shoulder. However, it is impossible to know how they function in vivo during shoulder motion. To help elucidate this stabilizing role, we conducted in vivo three-dimensional kinematics of the normal shoulder joint using a markerless bone-registration technique. Magnetic resonance images of 14 shoulder joints of 7 healthy volunteers were acquired for 7 isometric abduction positions between 0° and 180°. We then calculated three-dimensional shortest paths between the origin and insertion of each ligament based on anatomical study in each abduction position. At 0° of abduction, the posterior band of the coracohumeral ligament displayed the maximum length. At 30° of abduction, the superior glenohumeral ligament displayed the maximum length. At 60° of abduction, the anterior band of the coracohumeral ligament and the middle glenohumeral ligament displayed the maximum length. At 120° of abduction, the anterior band of the inferior glenohumeral ligament displayed the maximum length. We think that the maximum length of these results is an important influence on the function of the soft tissue stabilizer.