

Biomechanical Analysis of the Rotator Cuff Function During Elevation Motion in Scapula Plane using a Skeletal Muscle Model

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The purpose of this study was to estimate force of muscles that constituted the rotator cuff during elevation motion in scapula plane, using a skeletal muscle model and quantitatively evaluate rotator cuff function in vivo. A healthy volunteer was measured with an open MR and CT system at elevation positions in scapula plane (MR: 30°, 60°, 90°, 120°, 150°, CT: 0°).

After reconstruction three-dimensional MRI-based and CT-based bone surface models, matched each models with registration technique. Then supraspinatus, infraspinatus, subscapularis, teres minor, deltoid (anterior, middle, posterior portions) represented as plural lines. These lines were proportional to physiologic cross-sectional area (PCSA) and defined straight line to bind origin and insertion. Force of supraspinatus became greatest at 59° of elevation. Subsequently force of deltoid middle portion became greatest at 89° of elevation. Infraspinatus and subscapularis were active at the meantime. In addition, supraspinatus was active during elevation. These results resembled clinical finding and were proved force couples that contribute to mobility and stability of shoulder complex.