Rotator Cuff Tendon Surface Strain during Glenohumeral Motion: A Cadaveric Model to Assess the Effects of Mechanical Load and Joint Position

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The rotator cuff muscles stabilize the glenohumeral joint which consists of the humeral head and the glenoid. This ball-and-socket joint enables the shoulder to have a wide range of motion. There are four muscles that create the rotator cuff (RC): Subscapularis, Infraspinatus, Supraspinatus, and Teres Minor. Each of these RC muscles serves a unique role in movements such as adduction and rotation. Injuries such as shoulder impact or jerking movements of the shoulder are common incidents that cause a rotator cuff tear (RCT). RCTs can be a partial or full tear and symptomatic or asymptomatic. Patients are more likely to seek treatment if they have a symptomatic tear because of pain or difficulties with typical movements. Nearly two-thirds of all RCTs are asymptomatic and can be left untreated. Given that RCTs are difficult to identify and their tear progression, this creates a critical need to identify the surface strain of RC tendons from mechanical loading and joint position so that RCTs can be treated before muscle and tendon atrophy occurs. Here we propose a cadaveric study to analyze the surface strain of the supraspinatus tendon during passive adduction using an existing glenohumeral testing system and a 2D image correlation. Furthermore, we propose to apply this system to investigate the effect of RC load and joint position on tendon strain. The objective of this project is to better understand how the position of the glenohumeral joint and loading on the RC tendons affect the surface strain of the tendons.