INTRODUCTION:
Valgus elbow instability commonly occurs in baseball pitchers following repetitive microtears of the medial collateral ligament (MCL) from overuse. Traumatic injuries, such as elbow dislocations, usually cause complete disruption of the MCL. The optimal method to rehabilitate the MCL-deficient elbow has received little attention in the literature. The purpose of this study was twofold: to quantify the relative contribution of muscle activity to valgus elbow stability, and to determine the effect of forearm position during rehabilitation of the MCL-deficient elbow.

METHODS:
Ten fresh-frozen cadaveric elbow specimens (mean age: 69 ± 10 years) were mounted in a specialized testing apparatus which employs active tendon loading to produce elbow and forearm motions. Simulated active and passive elbow flexion were performed with the humerus mounted in the vertical position and the forearm maintained in both supination and pronation. The magnitudes of the tendons loads for active motion were derived by apportioning muscle loading in accordance with previous EMG studies and physiological cross-sectional areas. An electromagnetic tracking device (Flock of Birds, Ascension Technologies, Burlington, VT) was used to quantify motion pathways of the ulna with respect to the humerus. Testing was first performed on intact specimens. Following this, each specimen underwent sectioning of the common flexor-pronator muscle origin and the medial collateral ligament complex, and the testing protocol was repeated. Valgus elbow instability was quantified by internal-external rotation of the elbow regardless of forearm position and provides stability similar to that of an intact specimen. Muscle actuation presumably applies a compressive force across the elbow articulation, thereby contributing to elbow stability. Active mobilization of the elbow during rehabilitation would appear to be safe in the setting of a medial collateral ligament deficient elbow. This rehabilitation approach may also be useful following surgical procedures which violate the MCL, or following ligament healing. Supination of the forearm likely closes the radial side of the elbow with the forearm in supination should minimize instability and allow rehabilitation of the MCL-deficient elbows.

RESULTS:
Compared to the intact elbow, transection of the MCL did not cause a decrease in elbow stability during simulated active motion with the forearm in either pronation or supination. (p > 0.05) (Figures 1 & 2).

DISCUSSION:
In this in-vitro model, muscle activation appears to be an important stabilizer of the elbow regardless of forearm position and provides stability similar to that of an intact specimen. Muscle actuation presumably applies a compressive force across the elbow articulation, thereby contributing to elbow stability. Active mobilization of the elbow during rehabilitation would appear to be safe in the setting of a medial collateral ligament deficient elbow. Splinting and passive mobilization of the medial collateral ligament deficient elbow with the forearm in supination should minimize instability and allow ligament healing. Supination of the forearm likely closes the radial side of the elbow by pivoting around the intact lateral ligamentous complex, thereby stabilizing the elbow. This rehabilitation approach may also be useful following surgical procedures which violate the MCL, or following reconstruction of the MCL for chronic instability.

REFERENCES:

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