SINGLE STRAND LIGAMENT RECONSTRUCTION OF THE MEDIAL COLLATERAL LIGAMENT RESTORES VALGUS ELBOW STABILITY

INTRODUCTION:
The anterior bundle of the medial collateral ligament (MCL) complex has been shown to be the most important valgus stabilizer of the elbow\(^2\). The anterior bundle has been further subdivided into three parts; the anterior band, central band, and posterior band\(^3\). Previous studies have suggested that the central band is the key to valgus stability\(^4\), however none have quantified its stabilizing effect. The optimal method for reconstruction of MCL insufficiency has received little attention in the literature. The purpose of this study was twofold: to determine the relative contribution of valgus elbow stabilizers, and to determine the effectiveness of a simplified single strand MCL reconstruction.

METHODOLOGY:
Eleven cadaveric elbow specimens (mean age: 71±10 years) were mounted in a specialized testing apparatus\(^4\). This device allows the humerus to be positioned in both varus and valgus gravity loaded orientations, and permits unrestricted range of motion of the elbow and forearm. Sequential sectioning of the medial valgus elbow stabilizers was performed (10 specimens). Testing was first performed on the intact elbow, and then following each stage of a sequential cutting protocol (capsule, flexor-pronator muscle group, posterior bundle, randomized anterior-posterior or posterior-anterior bands, and central band) (Figure 1).

![Flow chart of sequential sectioning protocol.](image1)

Finally, a single strand reconstruction of the medial collateral ligament was performed using the extensor carpi radialis tendon (8 specimens). The elbow was moved passively through a full arc of flexion while motion of the ulna with respect to the humerus was analyzed using an electromagnetic tracking system (Flock of Birds, Ascension Technologies, Burlington, VT). The maximum varus-valgus (V-V) laxity was calculated as the difference in V-V position with the arm in the varus and valgus gravity loaded orientations. Statistical analysis utilized one- and two-way repeated measures ANOVA's and post-hoc Student-Newman-Keuls tests with alpha set at 0.05.

RESULTS:
Maximal varus-valgus laxity was not significantly different between any of the sectionings until the central band was cut (p<0.05) (Figure 2). The mean varus-valgus laxity with the forearm in supination was 6.6 ± 2.4° for the intact specimens, 34.2 ± 5.6° with central band cut and 9.0 ± 2.5° following MCL reconstruction (Figure 3). There was no significant difference in the maximal varus-valgus laxity between the intact and reconstructed elbows (p>0.05).

![Maximum varus-valgus (V-V) laxity measured during passive elbow flexion after each stage of sectioning with the forearm in pronation and supination (n=10).](image2)

DISCUSSION:
Our results demonstrate that the central band is an important valgus stabilizer of the elbow providing stability similar to that of the intact specimen. This agrees with previous studies by Fuss\(^5\) and others. The consistent stability provided by the central band, whose average width was only 3 mm, suggests that this portion of the MCL must be relatively isometric. The central band of the MCL should be preserved if possible in patients undergoing release of the MCL such as for the treatment of post traumatic elbow contractures. Although a double strand reconstruction has been recommended clinically\(^6\), our in-vitro data supports the use of a simplified single strand reconstruction for the management of chronic MCL insufficiency. Such a reconstruction could incorporate the use of suture anchors to further simplify the graft placement and protect surrounding neurovascular structures which are at risk with the conventional two strand repair.

REFERENCES:

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