A Biomechanical Analysis of Long Head Biceps Tenodesis Techniques in the Bicipital Groove

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INTRODUCTION:
The surgical management of long head biceps (LHB) tendinosis includes tenotomy or tenodesis. Tenodesis can be accomplished by a variety of surgical techniques. One arthroscopic surgical technique incorporates the LHB into the bicipital groove using a cinching anchor (Piton, Tornier, Minneapolis, MN) utilizing a Krackow stitch. Previous data suggests that the Krackow stitch offers a biomechanical advantage during tendon repair. Using human cadaver shoulders, we compare three separate reparative stitch configurations with the aim of evaluating mechanism of failure, displacement, and load to failure for LHB tenodesis. We hypothesized that LHB tenodesis in the proximal groove using a cinching suture anchor will have comparable strength to other previously reported modes of fixation, and that a Krackow stitch configuration will have the strongest load to failure strength compared to a simple or modified locking simple loop stitch.

METHODS:
Eighteen human shoulders were utilized for this study. DEXA scans of the bicipital groove and humeral diaphysis were performed on all samples prior to instrumentation. A total of 6 samples were repaired for each treatment group. Each sample was randomly assigned to one of three repair techniques: simple suture (SS), Krackow stitch (KS), or lasso loop (LL). For each treatment, a knotless fixation implant with size 2 suture was inserted in the proximal humerus utilizing the appropriate stitch (Figure 2). All samples were mounted rigidly in an MTS frame. Following dynamic testing, samples were loaded in tension until failure. A one-way analysis of variance was used to determine statistical significance between outcome variables between treatment groups. In all cases, statistical significance was set to p < 0.05.

RESULTS:
All LL samples failed prior to the completion of fatigue tests. Samples treated with the KS withstood statistically significantly (p < 0.05) more fatigue cycles in comparison to the LL or SS group. The failure mechanism in all SS and all LL constructs was the tendon sliding through the suture. KS failure mechanism was suture breakage in all groups. The mean failure load (±1 SD) was statistically significantly higher in the KS (158.3 ± 32.2 N) and SS (109.8 ± 41.1 N) treatment groups compared to the LL group (46.6 ± 3.8 N) (p< 0.001) (Figure 1). There were no statistically significant differences for the displacement (avg 5.1 mm) at failure between groups.

SIGNIFICANCE:
LHB tenodesis utilizing a knotless fixation anchor (Piton) is comparable to other fixation techniques; a krackow stitch is superior to the simple or lasso loop stitch.