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A comparison of cortical button with interference screw versus suture anchor techniques for distal biceps brachii tendon repairs

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Background: Distal biceps brachii tendon repairs performed by a "tension slide technique" with a cortical button and interference screw (CB) are stronger than repairs by suture anchor (SA) techniques in biomechanical studies. However, clinical comparison of the 2 techniques is lacking in the literature.
Methods: Distal biceps tendon ruptures repaired with either a CB or SA technique through a single incision were identified from 2008 to 2013 at a single institution. Patients more than a year out from surgery completed a Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire. In addition, patients were assessed for range of motion, strength, and complications. All assessments were performed by individuals blinded to the surgical technique. Strength and motion values from the operative extremity minus the nonoperative arm values yielded differential values that were averaged and used to compare treatment groups.
Results: The CB ($n = 20$) and SA ($n = 17$) groups had similar demographics, except for the time from the surgery to evaluation (18 ± 5 vs 32 ± 15 months, respectively; $P = .007$). Range of motion differed slightly between the groups. The CB group demonstrated better pronation ($0° \pm 5°$ vs $-4° \pm 10°$; $P < .05$), and the SA group demonstrated better flexion ($2° \pm 0°$ vs $-3° \pm 5°$; $P < .05$) and supination ($-2° \pm 5°$ vs $-7° \pm 12°$; $P < .05$). Strength did not differ significantly between the groups. DASH scores did not significantly differ between the groups with univariate analysis, but multivariate analysis demonstrated slightly better DASH scores with the CB technique (4.5 ± 4.4 vs 10.3 ± 14.9; $P < .0009$). Complication rates were similar between groups (CB 30%, SA 35%; $P > .05$).
Conclusion: CB and SA techniques provide good clinical results with similar complication rates.
Level of evidence: Level III, Retrospective Cohort Design, Treatment Study.

Keywords: Distal biceps brachii tendon repair; cortical button; suture anchor; interference screw

Surgical technique for distal biceps repair has evolved over the years in an effort to limit surgical morbidities. Early surgical techniques required an extensive anterior or double-incision approach to create bone tunnels through the radial tuberosity. These approaches were later modified to a

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muscle-splitting double-incision approach to avoid subperiosteal dissection of the ulna and the potential complication of heterotopic ossification.[3,11] The advent of newer fixation devices has led to a renewed interest in the single-incision approach and includes suture anchors, interference screws, and cortical buttons.

Biomechanically, the cortical button has superior fatigue and ultimate strength compared with interference screws, suture anchors, and transosseous tunnels.[9] Tendon displacement or gap formation was similar among the fixation devices. The tension slide technique is a cortical button that allows intraosseous fixation of the distal biceps tendon.[18] This construct has ultimate strength similar to that of the cortical button without interosseous placement of the tendon but results in less gap formation, which may have important clinical implications.[17] The addition of an interference screw did not improve strength or reduce gap formation but did provide a more anatomic repair of the distal biceps.[17] Careful assessment of postoperative supination strength demonstrates weakness if the distal biceps tendon footprint is not restored anatomically.[16]

In our study, we directly compare a tension slide technique performed with a cortical button and interference screw (CB) with a suture anchor (SA) technique. We hypothesize that these techniques will have similar clinical outcomes and complications.

Materials and methods

Distal biceps tendon ruptures repaired with CB or SA technique from 2008 to 2013 were identified among 3 orthopedic surgeons at a single academic institution. Patients were included if they were older than 18 years, at least 12 months from surgery, and repaired through a single incision with either CB or SA. Exclusion criteria included double-incision techniques, chronic biceps tendon tears requiring allograft or autograft tendons, bilateral biceps tendon repairs, and contralateral arm weakness from prior trauma or neurologic injuries. Ninety-three patients met enrollment criteria.

The tension slide technique was performed with a cortical button and interference screw per the manufacturer's technique guide (Arthrex, Naples, FL, USA). SA repair was performed with either two GII suture anchors (DePuy Mitek, Warsaw, IN, USA) or 3.0-mm suture tacks (SutureTak; Arthrex, Naples, FL, USA) as previously described.[6] The surgical approach was the same for both techniques. All patients in both treatment groups underwent a standard rehabilitation protocol at our institution. Patients began active range of motion (ROM) at 5 to 7 days postoperatively as long as there were no signs of wound dehiscence. Beginning at 6 weeks, patients were advanced to a 10-pound lifting restriction, and at 12 weeks they were allowed to resume activity as tolerated. No bracing was used, and all patients attended formal physical therapy sessions.

A total of 37 patients were enrolled in the study (20 CB, 17 SA). By investigators blinded to surgical technique, patients were assessed for ROM and strength with a standard goniometer (degrees) and dynamometer (pounds, hand held; Lafayette Instrument Co, Lafayette, IN, USA), respectively. Strength measurements were taken with the arm adducted and elbow flexed to 90°. Flexion strength was measured with the hand supinated, and an average of 5 maximum exertions was recorded. Supination strength was measured with the hand in neutral position, and again the average of 5 maximum exertions was recorded. The operative arm was compared with the nonoperative arm to obtain differential ROM and strength measurements. Values were obtained by subtracting the operative arm values from the nonoperative arm values. A lower or more negative number indicated a greater level of stiffness or weakness (except for extension, which is opposite).

The Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire, visual analog scale pain scores (range, 0-10), and complications were documented. DASH scores were obtained only from the operative extremity. Paresthesias and numbness of the dorsal hand and thumb were attributed to the superficial radial nerve; the same symptoms over the volar, lateral forearm distal to the incision were attributed to the lateral antebrachial cutaneous nerve.

The primary outcome measure of this study was DASH scores. Statistical significance was set to $P < .05$. A priori power analysis ($P = .80$) using a minimal meaningful clinical difference of 10.2 DASH score required 13 patients in each group.[7,14]

Univariate analyses were performed by 2-sample t tests to compare DASH, ROM, and strength between the CB and SA groups. After this, multivariate regression analysis was completed to adjust for time between injury and surgery, time between surgery and evaluation, existence of complications, smoking status, workers' compensation, and arm dominance. All analyses were completed with R version 2.15.2 software (The R Foundation for Statistical Computing) on a Mac OS platform. All other analyses were carried out with 2-sample t tests, Mann-Whitney tests, and χ^2 tests. All data are presented as mean ± standard deviation.

Results

Both treatment groups were comparable with regard to sex, age, time from injury to surgery, number of active smokers, dominant extremity affected, and workers' compensation cases (Table I). The time from surgery to evaluation was significantly shorter in the CB group (18 ± 5 months; range, 12-25 months) than in the SA group (32 ± 15 months; range, 12-55 months; $P = .007$).

The CB group demonstrated slightly better DASH scores than the SA group with multivariate analysis (4.5 ± 4.4 vs 10.3 ± 14.9; $P = .0009$). Postoperative strength relative to the nonoperative extremity did not differ between the groups, and there were small differences in ROM (Table II). Average flexion ROM, relative to the nonoperative extremity, was slightly better in the SA group (2° ± 0°) compared with the CB group (−3° ± 5°; $P = .0061$) in the univariate model. In the multivariate analysis, flexion (CB −3° ± 5° vs SA 2° ± 0°; $P = .0073$) and supination (CB −7° ± 12° vs SA −2° ± 5°; $P = .0166$) ROM differences were again slightly better in the SA group. The CB group did have slightly better pronation relative to the nonoperative extremity in the multivariate analysis. The original strength and ROM measurements for the operative and nonoperative extremities in both treatment groups are presented in Table III, which demonstrates that supination was