Is Therapy Necessary After Distal Biceps Tendon Repair?

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Abstract The EndoButton technique of distal biceps tendon repair provides strong biomechanical fixation. This strength of fixation may allow earlier postoperative range of motion (ROM). A retrospective review of 15 male patients undergoing single incision EndoButton repairs was used. Six subjects participated in conventional supervised postoperative rehabilitation while nine subjects were allowed unrestricted ROM after 2 weeks. Final ROM, time to full ROM, and Disabilities of Arm Shoulder and Hand (DASH) scores were compared. There was a significant difference for time to full ROM ($p < 0.05$). The mean time to full ROM was 8.67 weeks for the supervised therapy group and 4.38 weeks for the unrestricted group. There were no reruptures in either group. There were no significant differences in final ROM or DASH scores. These data suggest that unrestricted ROM results in a quicker return to full ROM without an increased risk of rerupture.

Keywords Distal biceps tendon • EndoButton • Therapy • Tendon repair

Introduction

Rupture of the distal biceps brachii tendon accounts for only 3% of biceps tendon ruptures [18]; however, authors have cited an average loss of 40% supination strength and a 30% average loss in flexion strength [3, 19]. Initially, a conservative, nonsurgical approach was advised [3, 12, 19,

22], while now there is a trend toward surgical repair or reconstruction of the distal biceps tendon [2, 3, 5, 7, 8, 18]. Several studies have cited superior results with repair of the biceps tendon with the patients being able to return to their preinjury level of activity after surgery [1–3, 8, 18, 21]. The evolution of the distal biceps repair has led the authors to adopt a single incision, EndoButton (Smith & Nephew, Andover, MA, USA) technique. The strength of this fixation has been documented clinically and biomechanically [2, 23]. In light of the advent of stronger fixation, the purpose of this study was to determine if we could accelerate the postoperative rehabilitation. Our hypothesis was that patients with a surgically repaired distal biceps tendon via the EndoButton could undergo an accelerated rehabilitation process with a low risk of rerupture.

Materials and Methods

A retrospective chart review was performed of all patients undergoing a distal biceps tendon repair using the EndoButton fixation from 2003 to 2005 with at least a 1-year minimum follow-up. The senior authors (EES and REI) performed the surgery on all patients. A total of 17 patients were considered for the study, but two were unavailable for follow-up. Of the 15 patients that were available for follow-up, four required repairs of the nondominant arm and 11 of the dominant arm. All patients were male with ages ranging from 31 to 64 years and a mean age of 46 years at the time of surgery.

All surgeries were performed with Loupe magnification using the EndoButton fixation technique with number 2 Fiberwire (Arthrex, Naples, FL, USA) through a single anterior incision described by Bain et al. [2]. Capture of the EndoButton was confirmed with intraoperative fluoroscopy.

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The surgical dissection for this procedure is similar to others in that the distal biceps tendon is isolated and the radial tuberosity is exposed while protecting the radial nerve and its branches. Number 2 Fiberwire or other nonabsorbable suture is passed through the end of the tendon in a locking fashion with at least four throws to grab sufficient tendon. The Endobutton is tied to the end of the biceps tendon with a small 2-mm gap between the end of the tendon and the Endobutton. The radial tuberosity is prepared in full supination and the near cortex is decorticated down to cancellous bone. The far cortex is drilled with a bit the same width as the Endobutton. Passing sutures are placed in the peripheral holes in the Endobutton and these passing sutures are passed through the radial hole with a blunted Keith needle and retrieved percutaneously on the dorsal side of the forearm. Traction is placed on one of the passing sutures and the biceps tendon is pulled into the radial corticotomy. Once the Endobutton is through the far cortex, the other suture is pulled thereby flipping the Endobutton locking it on the other side of the radius and securing the biceps tendon. This portion of the procedure can be performed with fluoroscopic guidance.

The patients were evaluated with range of motion (ROM) measurements and clinically at 1 year with Disabilities of Arm Shoulder and Hand (DASH) scores. The patients were divided into two groups: supervised therapy (group 1, $n=6$) and no therapy (group 2, $n=9$). Of the 15 patients that were contacted, 13 agreed to complete the DASH questionnaire (group 1, $n=4$; group 2, $n=9$). In both groups, a posterior splint at 90° was worn for the first 2 weeks. In the supervised therapy group, a hinged brace was worn for the next 4 weeks. Passive ROM was initiated at 2 weeks but extension was limited to 40° and increased by 10°/week as tolerated with full extension allowed at 6 weeks postoperative. The nonsupervised therapy group had the postoperative splint removed at 2 weeks and were allowed to use the arm for simple daily activities such as bathing, lifting a coffee cup, and simple lifting of no greater than 2 lbs.

Descriptive statistics comparing end ROM and time to full ROM in both groups of patients were computed. A one-way analysis of variance was used to compare the time to full ROM of the two groups. DASH scores were calculated and compared between the two groups. The DASH Outcome Measure is a 30-item self-report questionnaire designed to measure physical function and symptoms in people with any of several musculoskeletal disorders of the upper limb. Each item of the DASH has five response options with a score summation range from 0 (no disability/symptoms) to 100 (greater disability/symptoms). A high DASH score indicates more disability. The mean DASH score in population controls is 6.2. Manual muscle testing was also performed by the examiner.

Results

Follow-up averaged 23 months (12–36 months) and all patients were satisfied with their results. The DASH score for group 1 (supervised therapy) averaged 3.1 and group 2 (no therapy) averaged 1. The six patients who participated in therapy achieved an average of 139.1° flexion, 1.5° extension, 76.6° supination, and 75.8° pronation in an average of 8.6 weeks. The nine patients who did not receive formal therapy achieved an average of 138.5° flexion, 1.5° extension, 76.5° supination, and 77.5° pronation in an average of 4.1 weeks. There was a significant difference in the time to full ROM between the two groups ($p<0.05$) with the unsupervised group achieving full ROM more rapidly. Manual muscle testing revealed 5/5 strength for elbow flexion and supination. There were no cases of heterotopic ossification or reruptures. There were two cases of transient lateral antebrachial cutaneous nerve palsies that resolved in 6 weeks.

Discussion

Nonoperative treatment of distal bicep tendon ruptures has been reported to result in loss of flexion and supination strength along with decreased patient satisfaction [3, 12, 19, 22]. This prompted many surgeons to recommend surgical repair. Most of the various surgical repairs and reconstructions have yielded good functional and clinical results [3–5, 7, 9]. There are, however, several complications such as heterotopic ossification and neuropraxias that have occurred with particular methods of repair [10, 11, 14]. There has been a natural evolution of the repair techniques to avoid the complications and improve fixation strength.

One of the proposed advantages of the single incision approach is a decrease in complications such as heterotopic ossification and radioulnar synostosis and injury to the posterior interosseous nerve [2, 4, 18, 24]. Single incision techniques usually involve the use of suture anchors, the EndoButton, or an interference screw [2, 4, 13, 15, 16, 25].

A recent study compared the strength of fixation of suture anchors to the EndoButton [23]. Biomechanically, the EndoButton was found to have a higher load to failure and remained in contact with the bone longer before failure, but the difference did not reach statistical significance [23]. One of the best biomechanical studies was performed by Mazzocca et al. and compared the fixation strength of suture anchors, the EndoButton, traditional bone tunnels, and interference screws. They found that the EndoButton had a statistically higher load to failure than the other three methods [17].

The first clinical results using the EndoButton were reported by Bain et al. [2]. They reported on 12 patients

with no significant complications and good results. We, therefore, started performing our repairs using the EndoButton technique. Based on the good results of some of our noncompliant patients that removed their splints, we modified our postoperative therapy protocol. Instead of supervised physical therapy with hinged braces, we simply removed the splint 2 weeks postoperatively and asked the patient to not lift anymore than 2 lbs. They were allowed to use the arm for routine activities of daily living including active elbow flexion. These patients with an accelerated unsupervised rehabilitation protocol were compared to a cohort of patients who had a more conventional supervised rehabilitation protocol.

All patients were surgically treated in a similar fashion with fixation of the distal biceps to the radial tuberosity using the EndoButton, but the postoperative protocols differed markedly after the first 2 weeks. Interestingly, we found that the unsupervised group regained their motion quicker, had no reruptures, and had similar DASH scores. This would seem to indicate that the strength of fixation provided by the Endobutton is sufficient to allow early active unsupervised ROM. A study by Cheung et al. utilized a more aggressive rehabilitation protocol and they also found that they had a more rapid return of ROM, although they still had the patients in a postoperative hinged brace [6]. In addition, Ozyureko et al. compared the clinical results of the two incision bone tunnel fixation to single incision suture anchor or EndoButton fixation and found that the results were similar in all three groups but the operative time was decreased with both of the single incision techniques and the return to work and sport were quicker as well [20].

These data provoke the idea to reassess the need of therapy and the possibility of overutilization of therapeutic services for ROM regarding this surgical procedure. Therapy still may be warranted on an individual basis if ROM goals are not met or a patient has pain complaints where modalities for pain could assist in achieving full ROM. Therapeutic strengthening or a work-hardening program may be appropriately prescribed after full ROM is achieved, as the patient may need assistance in strengthening the appropriate muscle groups for return to sport or work.

This study is limited by the fact that it is a retrospective study with a small sample size and an uneven number of patients in each group. However, even with a small sample size, statistical significance was reached with regard to ROM as the differences between the two groups was so large. Further study with a larger subject population is necessary to support these findings. Additional research might also be warranted for this surgical technique focusing on more detailed strength measurement, as this report did not look at dynamometer-measured strength and time to

return to full strength but some of these data are reflected in the DASH score.

In conclusion, the EndoButton fixation has been shown to have superior fixation strength at time 0 and yields equivalent clinical outcomes with decreased operative time and complications. It also seems to be strong enough to allow early active ROM with quicker return of normal ROM with minimal risk for rerupture.

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