Use of the Endobutton in repair of the distal biceps brachii tendon

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Rupture of the distal biceps tendon is a relatively uncommon injury. It typically occurs in middle-aged men who sustain a sudden force to a flexed arm. The resultant strong contraction of the biceps causes the tendon sheath to detach from the radial tuberosity. This injury represents only 3% of all injuries to the biceps tendon; 96% of such injuries involve the long head, and 1% involve the short head (1, 2). Several theories about predisposing factors have been postulated. These include avascularity of the tendon, mechanical impingement of the tendon with pronation of the forearm, degenerative changes within the tendon, and hypertrophic lipping of the anterior margin of the radial tuberosity, which can then cause a rent in the tendon (3, 4).

Clinically, patients present with a history of a sudden force to a flexed arm and then a "pop." They typically report immediate swelling in the antecubital fossa and a deformity of the biceps muscle. They also report significant weakness with flexion and supination of the arm. The diagnosis is usually very easy to make clinically but can be confirmed with magnetic resonance imaging.

Nonoperative treatment has been attempted but has often led to continued weakness of the involved extremity, especially with supination (1, 5, 6). This weakness is frequently unacceptable to patients who are athletically active or who do heavy labor (7, 8). Therefore, surgical correction is commonly the treatment of choice.

Many surgical techniques have been described in the literature (9–14). These techniques have varied mainly in the location of reinsertion of the tendon. Reattachment of the biceps brachii has been proposed, but this technique resulted in strength deficits with supination of the forearm (5). Most authors now recommend anatomic reattachment to the radial tuberosity (9–14). Initially, this was accomplished through a single anterior approach that required extensive volar dissection to expose the radial tuberosity (2). Several reports began to surface identifying injury to the radial and posterior interosseous nerves (5, 15). It was speculated that the injury was caused by the excessive traction required during the procedure. Boyd and Anderson (12), in an attempt to avoid this debilitative complication, described a two-incision technique to expose the radial tuberosity. Unfortunately, there have been subsequent reports of patients developing radioulnar synostosis following this procedure (16, 17). Several other techniques have also been reported, including the use of pull-out wires and external buttons (15, 18).

As a result, alternatives to the two-incision technique and the anterior approach with extensive volar dissection have been proposed. Reattachment of the tendon utilizing suture anchors was reported by Barnes et al (11). This technique resulted in a high success rate without complications. However, this operation is not without difficulty. It requires the surgeon to work in a fairly deep wound with the elbow flexed to place the suture into the tendon. Tying of the sutures is also critical to ensure that the tendon is approximated to the bone. Bain et al (10) recently reported the use of the Endobutton for repair of the tendon. This procedure allows for a relatively minimal single anterior incision to reattach the tendon without struggling in a small space. This is a report of our use of the Endobutton in 11 patients who suffered rupture of the distal biceps tendon.

MATERIALS AND METHODS

Eleven men and one woman aged 38 to 62 presented with rupture of the distal biceps tendon. Eleven presented acutely, and one presented 4 months after injury. The Endobutton (Acufex, Microsurgical, Inc, Mansfield, MA) was used to repair the tendon in each case through a minimal anterior approach.

Operative technique

Following administration of general anesthesia, a tourniquet was placed on the operative upper extremity. An S-shaped anterior incision was made over the antebrachial fossa. The bicipital bursa was identified, and subsequently the retracted distal stump was found and prepared outside the wound by freshening the end of the stump sharply. A #5 Ethibond suture was then placed into the stump, utilizing a modified Bunnell stitch. An Endobutton with a 15-mm loop was secured to the tendon by tying the suture to the loop. In the chronic case, direct traction was placed on the tendon allowing for gradual stretching of the myotendinous unit. This step was necessary to gain the length required to reattach the tendon.

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Next, with the arm fully extended and supinated, careful dissection was performed to expose the radial tuberosity. This dissection was kept to a minimum, and care was taken not to be too aggressive with retraction so as to avoid injury to the posterior interosseous nerve and radial nerve. Full supination at all times also helped protect these structures. A Beath pin was then placed through the radial tuberosity, exiting dorsally through the skin. The pin was placed as far medial as possible. With a 4.5-mm cannulated drill, both cortices of the radius were drilled. Next, an 8.0-mm acorn drill was utilized to prepare the hole in the near cortex for insertion of the tendon. Extreme care was taken with this step because the radius is a small bone, and this large-diameter drill could cause a fracture.

Once the holes were prepared, a #2 Vicryl suture was placed through the leading hole of the Endobutton, and a #0 Vicryl suture was placed in the trailing hole. These sutures were then threaded through the eyelet of the Beath pin. The pin was pulled through the dorsal aspect of the forearm, bringing the sutures along as well. Tension was placed on the leading suture to deliver the Endobutton through the dorsal cortex and the tendon into the cortical window. Once the tendon was in place, the trailing suture was tensioned to engage the Endobutton. This was all performed with the elbow in slight flexion to allow for the passage of the Endobutton.

The arm was taken through a range of motion to ensure that the tendon was well secured. The sutures were removed from the dorsal aspect of the forearm. Following closure of the incision, the patient was placed in a soft dressing and sling. Postoperatively, the patient was encouraged to remove the sling and begin passive extension. At 1 week, the sutures were removed and physical therapy was begun. Therapy included passive stretching for extension, pronation, and supination. Light resistive exercises were begun, and heavy lifting was limited for 8 weeks.

RESULTS

All patients were very satisfied with the results of their procedure. All returned to their previous level of activity without any limitations. No neurological complications were reported, and no evidence of radioulnar synostosis was present. The average range of motion was 0 degrees of extension to 136 degrees of flexion. Average supination and pronation were 86 and 84, respectively. Strength was measured clinically to be equal bilaterally with both flexion and supination. No other complications were experienced.

DISCUSSION

The technique described in this report differs from other modern techniques in two distinct ways. First, it is not necessary to work in the depths of the wound to suture the tendon back to the bone as is required with the suture anchor technique. The distal stump is prepared with attachment of the Endobutton outside the wound. Second, the tendon is secured within the medullary canal of the radius, which enhances the healing potential of the repair. The use of the Endobutton allows for easy passage of the tendon back to its anatomic location. It also provides for extremely secure fixation of the tendon. This enables the patient to have good range of motion and active flexion and supination soon after the procedure. As a result, patients return to work and their activities of daily living quickly.

In conclusion, the use of the Endobutton through a minimal anterior incision for repair of a distal biceps rupture is a very good alternative to the two-incision approach. Care can be taken to protect the nerve structures around the elbow, and the patient is allowed to mobilize immediately, preventing loss of range of motion.

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