Reconstruction of Chronic Distal Biceps Tendon Rupture using Fascia Lata Autograft

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ABSTRACT

Introduction: Distal biceps tendon ruptures are a rare injury and surgical reconstruction is typically recommended for chronic ruptures. There is no consensus regarding the most appropriate reconstruction technique. We present our experience with fascia lata autograft reconstructions of chronic distal biceps tendon ruptures using a modified single incision technique and distal fixation with suture anchors.

Materials and methods: We retrospectively reviewed the outcome of 12 male patients with chronic distal biceps tendon ruptures who had reconstruction using a fascia lata autograft through a single anterior approach. The age ranged from 29 to 62 years. The average delay to surgery was 26.5 weeks (range 6-68 weeks). A modified single anterior incision was utilized for all patients. Fascia lata autograft was attached distally to the bicipital tuberosity using suture anchors. Tension was set with the elbow in 50° of flexion. The average follow-up was 14.5 months (range 1.5-66 months). All patients were treated by the senior author (MSM).

Results: Eleven patients (92%) reported subjective improvement in elbow flexion and supination strength, as well as painless range of motion. The average elbow flexion/extension arc was 126° (5° flexion to 131° flexion) and the average supination/pronation arc was 167 degrees (87° pronation to 80° supination). Five patients underwent isokinetic flexion strength testing which revealed a restoration of 86% of strength when compared to the uninvolved side. Four patients underwent supination isokinetic strength testing which revealed a restoration of 87% of strength when compared to the uninvolved side. Four patients reported numbness in the superficial radial nerve distribution that recovered within 12 months. There were no complications of heterotopic ossification or graft rupture. There was no case of wound dehiscence at the elbow that required local suture. There was no case of heterotopic ossification or graft rupture. There was an onset of symptoms and often have partial tearing. Regardless the gender, diagnosis of distal biceps tendon rupture is often delayed leading to chronic injury.

A recent increase in understanding of distal biceps anatomy and function has led to the general recommendation for anatomic repair or reconstruction for both acute and chronic distal biceps tendon ruptures. Distal biceps tendon rupture can be considered chronic after 3 to 12 weeks. In general, reconstruction, rather than primary repair, is necessary after 6 weeks due to tendon retraction, scar formation and tissue atrophy. Operative techniques described include tenodesis to the brachialis and anatomic reconstruction using tendon grafts. Graft options include local lacertus fibrosis, autograft semitendinosis, split flexor carpi radialis, palmaris longus and fascia lata, and Achilles tendon allograft. Fixation techniques include bone tunnels, suture anchors, intrasosseous or interference screw fixation, suspensory cortical buttons and combinations of these techniques.

Fascia lata autograft has been used for biceps tendon reconstruction since 1956 when it was described by Wagner. Its use was later advocated in case reports and small case series by Hovelius and Josefsson in 1975, Kaplan et al in 2002 and Herren and Zdravkovic in 2004. Using this graft, techniques for fixation to the bicipital tuberosity reported include a key-hole, a loop-around, bone tunnels with and without ligament augmentation devices, and suture anchors.

We present our experience of chronic (>6 weeks) distal biceps tendon reconstruction using fascia lata autograft and distal anatomic fixation with suture anchors. This is the largest known case series of patients who have undergone this procedure by a single surgeon.
MATERIALS AND METHODS
After obtaining institutional reviewboard approval, we identified 12 patients with chronic distal biceps tendon ruptures who were treated with reconstruction using a fascia lata autograft between 1991 and 2003. Patients were identified by manually searching surgical logs. All patients were male with an average age of 42 years (range 28 to 62 years). Half of our patients were involved in workers’ compensation cases. The dominant extremity was involved in eight patients and the nondominant extremity in four patients. The average delay to surgery was 26.5 weeks (range 6-68 weeks) (Table 1). All patients were treated by the senior author (MSM).

The surgery was performed under general anaesthesia with a sterile tourniquet applied to the arm. A modified Henry approach to the elbow was used. Typically, a single anterior transverse incision crossing the antecubital fossa with longitudinal limbs was performed. In some cases, if the torn tendon was unable to be adequately retrieved, a second more proximal incision within the same interval was used to access the retracted distal biceps tendon. In these cases, an anterior skin bridge was left intact (Fig. 1). The lateral antebrachial cutaneous nerve, superficial radial nerve and the recurrent branch of the radial artery were identified and protected. The latter was ligated as necessary for extensile exposure. The posterior interosseous nerve was not identified but was protected by supinating the forearm. Blunt dissection was preferred, while the tuberosity and the overlying bursa were being located. Following identification of the retracted tendon and its native insertion, a lateral incision was made on the ipsilateral thigh to access the fascia lata. A 10 × 2.5 cm strip of fascia lata was harvested and tubularized using 2-0 Vicryl suture (Ethicon, Somerville, NJ) (Fig. 2). The fascial defect was not closed, and the wound was closed in an otherwise standard layered fashion. At this point, with the forearm in extreme supination to expose the bicipital tuberosity, a metallic marker was placed onto the tuberosity and a fluoroscopic image was taken to confirm its position. Two Mitek G2 suture anchors (DePuy Mitek, Inc, Raynham, MA) were then inserted into the tuberosity. Care was taken not to penetrate the far cortex when inserting the anchors. The anchor sutures were then passed through the tendon autograft in a double figure-of-eight interlocking fashion. The graft was secured proximally to the mobilized tendon in a pull-through figure-of-eight fashion using 3-0 Ethibond suture (Ethicon, Somerville, NJ) (Fig. 3). Tension was set at 50° of elbow flexion and full forearm supination and the sutures were tied-down. The tourniquet was released, and the incision closed in a standard
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Postoperatively, all patients were immobilized with the elbow in 50° of flexion for 6 weeks. Sutures were removed at the 2 weeks visit. At the 6 weeks visit, a standard therapy program was begun to regain range of motion, particularly active-assist flexion-extension and pronation-supination. At 12 weeks, gradual strengthening exercises were started.

RESULTS

Average follow-up was 14.5 months (range 1.5 to 66 months). Eleven patients (92%) reported subjective improvement in elbow flexion and supination strength, as well as painless range of motion. The average elbow flexion/extension arc range was 126° (5° flexion to 131° flexion) and the average supination/pronation arc was 167° (87° pronation to 80° supination). Five patients underwent isokinetic flexion strength testing using an isokinetic Cybex dynamometer (Lumex, Ronkonkoma, NY). There was an average restoration of 86% of strength when compared to the uninvolved side (range 79-100%). Four patients underwent supination isokinetic strength testing using the isokinetic Cybex dynamometer. There was an average restoration of 87% of strength when compared to uninvolved side (range 78-100%). Four patients had postoperative numbness in the superficial radial nerve distribution, all of which recovered within 12 months. There were no cases of heterotopic ossification, radioulnar synostosis or graft rupture. There was one case of wound dehiscence at the elbow that required local flap coverage and went on to heal uneventfully. Aside from a universal small herniation of the vastus lateralis which was neither functionally nor esthetically concerning to our patients, there were no donor wound site complications.

DISCUSSION

Chronic distal biceps tendon ruptures offer a challenging treatment dilemma. If treated nonoperatively, patients may have antecubital pain, proximal retraction of the biceps brachii (reverse Popeye deformity), decreased range of motion, decreased flexion and supination strength, and most commonly, increased fatigability with decreased endurance in both flexion and supination.3 Kahn et al reported a 21 to 55% loss in supination strength, 86% loss in supination endurance, 8 to 36% loss in flexion strength, and 62% loss in flexion endurance with nonoperative treatment when compared to the unaffected side.15 A recent report by Freeman et al showed that some patients treated nonoperatively may actually have lower DASH scores than those who were treated operatively and experienced operative complications.16 However, current advancements in reconstructive surgical techniques have led to improved function and decreased complications resulting from surgical intervention.2,5 Thus, operative fixation is currently recommended for most patients with chronic distal biceps tendon ruptures, except those who are low demand or not fit for surgery.2

We have presented a series of chronic distal biceps tendon reconstructions using a fascia lata autograft, performed through a modified, anterior approach and secured to the biceps tubercle with suture anchors. Our range-of-motion results (average 126° arc in flexion-extension and average 167° arc in pronation-supination) and isokinetic flexion strength (average 86% compared to uninvolved extremity) and supination strength (average 87%
Compared to uninvolved extremity) are comparable to previously reported studies using similar reconstruction techniques. The advantages and disadvantages of one-incision and two-incision techniques have been debated in the literature. Ultimately, the technique chosen is usually based on surgeon preference. While the overall incidence of complications may be similar between the one and two incision techniques, the one-incision technique historically has been associated with a higher rate of nerve injury. Advances in fixation, however, appear to have lowered the incidence of nerve injuries. Studies have shown no cases of permanent neurologic sequelae when using suture anchors and an anterior approach. In our study, four patients (25%) had self-limited neurapraxia of the superficial radial nerve, but no patients had permanent neurologic sequelae. No patients had rerupture within the follow-up period. Aside from one wound dehiscence that healed uneventfully following flap coverage, there were no other known complications in our study. Thus, common complications associated with distal biceps tendon repair and reconstruction may be avoided with this technique.

The source of the graft used for reconstruction must be selected based on patient preferences as well as surgeon comfort and experience. Fascia lata autograft was chosen in our patients because of its accessibility and the freedom it allows the surgeon to match the defect to the graft. The resultant fascial defect from graft harvest was not closed in this series, resulting in a small lateral thigh bulge due to vastus lateralis herniation. This was addressed pre-operatively and ultimately was not concerning to our patients either functionally or esthetically.

To our knowledge, this is the largest series in the literature presenting the results of this technique. Nevertheless, there are several limitations. While it is the largest known series, our numbers are still small. Furthermore, the study is retrospective, and therefore we are limited by the quality of the information initially recorded. Given its retrospective nature, not all patients had equivalent follow-up durations, clinical assessment or postoperative functional testing. No established, subjective outcomes measure was utilized. Of the patients studied, however, functional results are similar to those from studies utilizing similar operative techniques.

CONCLUSION

Reconstruction of chronic distal biceps tendon ruptures using fascia lata autografts, a modified single anterior incision technique, and anatomic distal suture anchor fixation offers a treatment option that can lead to satisfactory functional outcomes with a low risk of major complications.

REFERENCES

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