

SECTION II

ORIGINAL ARTICLES

Repair of Chronic Distal Biceps Brachii Tendon Rupture Using Free Autogenous Semitendinosus Tendon

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Distal biceps brachii tendon ruptures occur much less frequently than do their proximal counterparts. Distal tendon ruptures usually are associated with considerable function deficits and may require surgical treatment. Repair of chronic distal biceps brachii ruptures are extremely unusual. A free autogenous semitendinosus tendon graft was used to reconstruct the distal biceps tendon by reattaching the graft to the radial tuberosity via a 2-incision technique in a patient with symptoms and a chronic injury.

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Received: September 29, 1994.

Revised: May 24, 1995.

Accepted: September 5, 1995.

Distal biceps brachii tendon rupture is an uncommon injury. Gilcreest⁶ in 1939 reported that distal biceps tendon ruptures account for only 3% of all biceps brachii tendon ruptures.

Reports have advocated conservative treatment of distal biceps tendon ruptures.⁴ Loss of supination strength after biceps tendon rupture (as much as 60%) has led a number of authors to recommend anatomic surgical reattachment of the tendon.^{3,11} Most reports describe satisfactory results with reattaching the avulsed distal biceps tendon through a drill hole in the radial tuberosity, usually via a 2-incision technique.^{1-3,11,13,14} In chronic ruptures with proximal retraction of the biceps brachii tendon, direct reattachment may be difficult, if not impossible, and surgical attachment of the biceps to the brachialis has been described. Hovelius et al⁷ described the use of a fascia lata graft for reconstruction of a chronic distal biceps tendon rupture.

A case report using free autogenous semitendinosus graft for reconstruction of a chronic retracted distal biceps tendon is presented.

CASE REPORT

A 54-year-old right-hand dominant man was referred to the authors with a chronic left distal biceps tendon rupture of 1-year duration. This injury occurred when, while lifting a heavy piece of furniture, the patient felt a sharp tearing sensation within the left antecubital fossa. The pain subsided gradually, and the patient was treated conservatively by his primary care physician. The patient subsequently was referred to physical therapy. He presented with significant weakness of elbow flexion and supination during activities of daily living, and had antecubital elbow discomfort with vigorous activity.

Physical examination revealed a left arm deformity with proximal retraction of the biceps muscle belly. The distal biceps tendon was not palpable in the antecubital fossa. The patient had weakness (4/5) of elbow flexion and supination strength (4/5). Results of the motor strength examination on the right, unaffected side were normal (5/5) for elbow flexion and supination.

An extensile Henry's exposure over the anterior aspect of the elbow was used (Fig 1A–B) The subcutaneous scar tissue was incised, and the distal biceps tendon was encountered approximately 8 cm proximal to the elbow joint. The lacertus fibrosus was found detached and was scarred down to the tendon. A membrane overlying the tract to the bicipital tuberosity was identified, allowing easy digital dissection to the radial tuberosity. The tendon and the muscle belly were mobilized, but the tendon could not be advanced to its anatomic insertion. Recognizing the inability to restore the tendon to its anatomic position, the authors decided to use an intercalary semitendinosus hamstring tendon (Fig 1C). An 18-cm semitendinosus tendon was harvested using the Concept tendon stripper (Linvatec Inc., Largo, FL) after making a 2-inch incision over the pes anserine. A Thompson and Bunnell suture was placed in each end of the free tendon graft using O Ticron suture.

A curved Kelly clamp (V. Mueller Co, Waukegan, IL) was passed posteriorly through the tunnel where the distal biceps tendon had traversed previously. The Kelly clamp was advanced until the tip of the clamp was palpable directly underneath the skin and incised in a linear fashion approximately 1.5 inches in length. With careful dissection, the radial neck and the

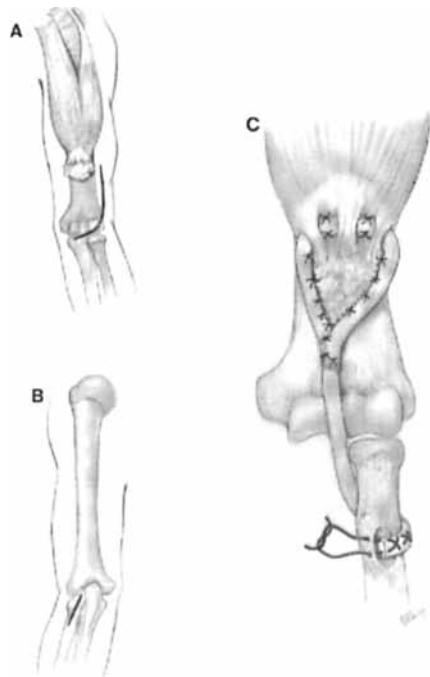


Fig 1A–C. (A) Henry's anterior approach was used to expose the scarred retracted mass of distal biceps tendon. (B) A secondary posterior incision was used to facilitate access to the radial tuberosity while maximizing protection of the posterior interosseous nerve. (C) The harvested semitendinosus tendon initially was secured in a scalloped crater of the radial tuberosity region and passed through the scar mass in a Pulvertaft type of suture repair. After passing through the scar mass, the tendon was sutured onto itself.

bicipital tuberosity were identified with maximum forearm pronation. A small motorized burr was used to create a scalloped crater (5 mm × 1 cm) at the bicipital tuberosity. Two drill holes were created medially and parallel to this hole, leaving a bone island of approximately 3 mm. A number 6 Mayo needle (Richard Allen Co, Richland, MI) was passed along with the suture of the free tendon graft through these small drill holes from the intramedullary canal to the outside. The free tendon end was pulled into the crater, and the sutures were tightened. The other end of the free

tendon was passed retrograde through the soft tissue tunnel and into the anterior surgical wound. A curved hemostat was used to make a tunnel through the scarred tendon stump of the distal biceps. The free autogenous tendon was passed from lateral, across the tendon tissue and exited medial distally. The elbow was flexed to 45° in neutral rotation, and tension was applied to advance the biceps. With tension on the free graft, the tendon was sutured to itself with multiple nonabsorbable O-Polydek sutures (Baxter Corp, Waukegan, IL). The reconstruction was reinforced by placing multiple sutures through the site of distal biceps tendon where the free graft traversed. The elbow was brought through flexion and extension without cut out of the tendon. Different degrees of tension within the biceps muscle were noted with pronation and supination in 90° elbow flexion. After surgery, the patient was placed in a posterior splint.

After 2 weeks, the patient started active extension and passive flexion exercise through a 30° to 105° arc of motion. At 2 months after surgery, active flexion and supination were initiated until full range of motion (ROM) was obtained. A strengthening program was continued until maximum function was obtained in 4 months. At 6 months after surgery, the patient had full ROM, and excellent elbow flexion and supination strength (5/5). The patient could discern a difference in elbow function for activities of daily living, and the elbow discomfort was resolved.

Cybox testing was done at 1 year of followup. The patient had 13% strength and 20% endurance deficits, respectively, for elbow flexion of the involved nondominant elbow. A 14% supination strength deficit was noted. Unfortunately, preoperative Cybox studies were not obtained. Subjectively, the patient was extremely pleased, was free of pain, could do all activities of daily living (including heavy lifting), and had normal elbow motion. Manual muscle testing was symmetric bilaterally. Radiographs revealed no heterotopic ossification.

DISCUSSION

Conservative treatment of distal biceps tendon ruptures has been advocated by several authors in early reports.^{4,8} Almost all of these reports suggested near normal function of the elbow.^{4,7,8} In 1977, Hovelius et al⁷ re-

ported a 50% satisfactory result after conservative treatment. Others, including Dobbie,⁵ Meherin and Kilgore,¹⁰ and Postacchini and Puddu,¹² advocated attachment of the biceps tendon to the brachialis muscle. Dobbie⁵ stated that the biceps is not essential for forearm supination and recommended against anatomic reattachment. However, these authors failed to measure and comment on the loss of supination strength.

As much as 60% decrease in flexion and supination strength has been reported in patients treated conservatively.¹¹ Although this may be adequate for daily activities, reports of fatigue are common. More recent reports have recommended reinsertion of distal biceps tendon for acute ruptures.^{1-3,11,13,14} In 1984, Morrey et al¹¹ reported 6 patients treated operatively and 3 treated nonoperatively. Patients who underwent operation had restoration of normal strength in flexion and supination, compared with patients who did not have surgery, who experienced a mean loss of 40% of supination strength and an average loss of flexion strength of 30%. Baker and Bierwagen³ also reported similar results comparing 10 patients with operative treatment and 3 who received conservative treatment. Subjective and objective results were superior in patients who underwent surgery. Other authors also have recommended early repair for acute rupture based on their satisfactory results.^{1,2,13,14}

There is little information on the treatment of chronic biceps tendon ruptures in the literature. Because of the proximal retraction of the biceps muscle, a direct reattachment might be impossible, and an alternative source of tendon graft may be necessary. Review of the literature showed that use of a fascia lata graft has been used for reconstruction of chronic distal biceps tendon rupture.^{7,10} To the authors' knowledge, the use of a semitendinosus graft has not been reported previously for chronic distal biceps ruptures. The advantages include the use of smaller incision for harvesting as compared with fascia lata graft harvesting, a robust tendon graft, and an adequate graft length.

This method for reconstruction of a chronically retracted biceps muscle after distal tendon rupture yielded a satisfactory result in this patient. The use of the semitendinosus graft has minimal donor site morbidity, is not associated with hamstring weakness (via Cybex testing), and is an alternative to a fascia lata graft in these unusual situations.⁹

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