



Primary repair of retracted distal biceps tendon ruptures in extreme flexion

Mark E. Morrey, MD, Matthew P. Abdel, MD, Joaquin Sanchez-Sotelo, MD, Bernard F. Morrey, MD*

Department of Orthopaedic Surgery, Mayo Clinic, Rochester, MN, USA

Background: Distal biceps tendon ruptures may have tendinous retraction, making primary repair difficult and calling into question the need for graft reconstruction. The decision for when to primarily fix or augment high-flexion repairs has not been addressed. We hypothesized high-flexion repairs would have good outcomes without graft augmentation. The purpose of this study was to examine allograft use and outcomes of distal biceps tendon ruptures requiring repair in greater than 60° of flexion.

Methods: This was a retrospective case-control study 188 distal biceps tendon repairs; of these, 19 chronic and 4 acute cases were identified with repairs of >60° of flexion using a 2-incision technique. Graft need, complications, and Mayo Elbow Performance Score to assess function, were examined with a record review. Patients were surveyed regarding return to work and subjective satisfaction. A control group matched for surgeon, chronicity, and age, but without a high-flexion repair, was compared with cases by using the Student paired *t* test.

Results: Graft augmentation was used in 1 patient with poor tendon quality. The Mayo Elbow Performance Score was 100 for all 23 patients, with extension/flexion range of motion from 3° to 138°. All were subjectively “very satisfied/satisfied,” with full work return, yet 3 reported mild fatigability. There were 4 complications: 3 transient lateral antebrachial cutaneous neurapraxias and 1 rerupture at the myotendinous junction after re-trauma. Differences between cases and controls were not statistically significant.

Conclusion: Contracted distal biceps tendons may be reliably reattached to their anatomic insertion with up to 90° of elbow flexion. This lessens the need for reconstruction in such circumstances.

Level of evidence: Level III, Case Control Design, Treatment Study.

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Keywords: Distal biceps tendon repair; chronic biceps rupture; outcomes; allograft reconstruction; high-flexion repair; tendon retraction

Distal biceps tendon ruptures are relatively rare injuries, with a reported incidence of 1.2 per 100,000 persons per year. They represent between 3% and 10% of all

biceps ruptures.^{16,19} A preponderance of injuries occurs in male laborers or athletes aged between 30 and 60 years, with a broad peak in the fourth and fifth decades. Furthermore, smokers are at 7.5-times the risk as non-smokers to sustain such an injury.⁹ Tendon hypovascularity and intrinsic degeneration due to mechanical impingement have both been purported contributors to rupture.^{4,15,20}

This study was approved by the Mayo Clinic Institutional Review Board.

*Reprint requests: Bernard F. Morrey, MD, Mayo Clinic, Department of Orthopaedic Surgery, 200 First St, SW, Rochester, MN 55905, USA.

E-mail address: morrey.bernard@mayo.edu (B.F. Morrey).

The surgical treatment of these injuries became common after repair was found to have a better return of strength compared with nonoperative management. The ideal surgical technique for primary repair continues to be debated, but that operative treatment is superior to nonoperative treatment for endurance and return of strength in flexion (30% improvement) and supination (40% improvement) is generally accepted.^{1,16,17}

Early repair is advocated because of the higher rate of complications reported when surgery is delayed.¹⁰ Unfortunately, surgery may be delayed for several reasons, including delayed diagnosis. Chronic distal biceps tendon ruptures are typically associated with substantial retraction and poor tendon quality, which can also rarely occur in acute injuries.^{3,10} Augmented reconstruction with various graft materials has been reported for the treatment of these injuries because primary repair typically substantially limits the amount of passive elbow extension at the time of surgery and the ability of the tendon to reach its anatomic footprint. However, some stress relaxation of the primary repaired biceps occurs over time, and the threshold to decide between repair and augmented reconstruction is largely unknown.

Concerns with repairing a distal biceps tendon rupture in high flexion include the possibility of rerupture or residual flexion contracture. However, the outcome and complications of primary distal biceps repair in high flexion has not, to date, been specifically addressed. The purposes of this study were to compare distal biceps tendon ruptures repaired in greater than 60° of flexion (high-flexion group) with a control-matched group of primary repairs performed in less than 30° of flexion with regards to (1) need for graft augmentation, (2) functional results, (3) subjective patient satisfaction, (4) return to work, and (5) complications, specifically, rerupture and residual flexion contracture. The specific questions being addressed were:

1. Are grafts needed for high tension/flexion repairs?
2. Are functional and subjective outcomes comparable to those not requiring repair in high flexion?
3. Is there an increased incidence of rerupture or residual flexion contracture if repaired in high flexion?

Materials and methods

Patients

This was a case-control study in which a retrospective record review was performed on 188 consecutive distal biceps tendon repairs performed at our institution during a 10-year period using a 2-incision repair technique. The electronic medical records of all repairs, including operative notes, were reviewed to identify those satisfying our acceptance criterion. Twenty-three primary repairs had been performed in at least 60° of flexion and form the basis of the high-flexion group. These 23 elbows were matched by age, surgeon, and chronicity of injury to 23 separate

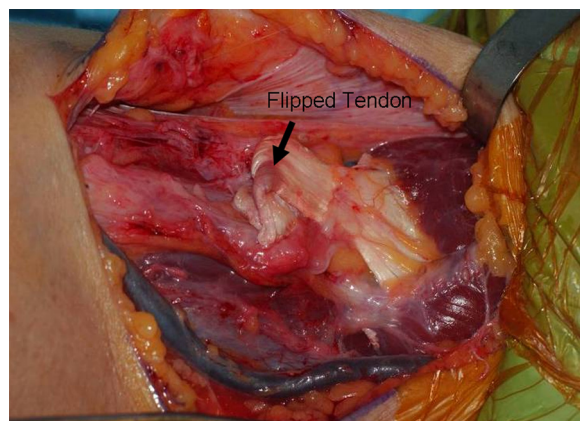


Figure 1 Biceps tendon flipped and scarred to the lacertus fibrosis.

patients whose distal biceps had been repaired in 30° of flexion or less.

The high-flexion group included 22 men and 1 woman, with a mean age at the time of surgery of 50 years (range, 33-67 years), who had undergone 19 chronic and 4 acute repairs. Acute injuries were defined as being repaired within 3 weeks of the injury, and chronic injuries were those repaired after 3 weeks. The mean time between injury and surgery for chronic injuries was 21 weeks (range, 4 to 112 weeks) and for acute injuries was 12 days (range, 7-14 days).

The control group included 5 acute and 18 chronic injuries, all primarily repaired in 30° of flexion or less (range, 0°-30°). There were 22 men and 1 woman, with a mean age at the time of surgery of 48 years (range, 30-63 years). The mean time between injury and surgery for chronic injuries was 7 weeks (range, 4-18 weeks) and for acute injuries was 6 days (range, 1-10 days).

Surgical technique

All primary repairs in the high-flexion and control groups were repaired using the Mayo modified 2-incision technique as described by Morrey et al.¹⁶ After a general anesthetic is administered, the surgical site undergoes sterile preparation, and a drape is applied. A transverse incision is made in the antecubital fossa, and the dissection is carried down to the biceps tendon remnant. Care is taken to protect the lateral antebrachial cutaneous nerve as it exits laterally between the biceps and the brachialis muscles.

In chronic cases, the tendon may be scarred proximally, but in several of the patients included in the study, it was found near an intact lacertus fibrosis and scarred to it in some cases (Fig. 1). The quality and position of the tendon and myotendinous unit and whether the lacertus remained intact varied for each of the cases and is documented in Tables I and II. A consistent finding for all repairs, whether acute or chronic, was that there was tendon attenuation and shortening from its normal length and bulk. The lacertus was torn in 16 cases, intact in 6, and partially torn in 1.

Once the tendon is identified, it is assessed for quality. In some instances, the tendon fibers are completely absent, with no distinct tendon stump at the lower end of the biceps muscle belly; allograft augmentation is oftentimes used in those situations. For the elbows included in this study, the amount of remaining tendon after

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