Re-rupture rate of primarily repaired distal biceps tendon injuries

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Background: Distal biceps tendon rupture is a common injury, and primary repair results in excellent return of function and strength. Complications resulting from distal biceps tendon repairs are well reported, but the incidence of re-ruptures has never been investigated.

Methods: A search of the Mayo Clinic’s Medical/Surgical Index was performed, and all distal biceps tendon repairs from January 1981 through May 2009 were identified. All patients who completed 12 months or more of follow-up were included. All charts were reviewed and patients contacted as necessary to identify a re-rupture. We also investigated the situation causing the re-rupture.

Results: We identified a total of 190 distal biceps tendon ruptures that underwent repair and met our inclusion and exclusion criteria. Of the 190 repairs, 172 (90.5%) were performed by the Mayo modification of the Boyd-Anderson 2-incision technique. Bilateral ruptures occurred in 13 patients (7.3%). Six primary ruptures (3.2%) occurred in women, 4 of the 6 being partial ruptures. Partial ruptures were found to be statistically more common than complete ruptures in women (P = .05). We identified 3 re-ruptures (1.5%), all occurring within 3 weeks of the index surgery.

Conclusion: The re-rupture rate after primary repair of the distal biceps tendon is low at 1.5% and occurs within 3 weeks of index repair. This appears to be due to patient compliance and excessive force placed on repairs. We also found the incidence of women who sustain a distal biceps tendon tear to be 3.2%, with partial tears being statistically more common than complete ruptures.

Level of evidence: Level IV, Case Series, Treatment Study.

Keywords: Distal biceps; biceps; repair; re-rupture; biceps failure

The incidence of distal biceps tendon ruptures is estimated to be 1.2 per 100,000 patients,22 with the peak incidence occurring in the fourth and fifth decades. The population sustaining this injury is predominantly male, and most occur in the dominant extremity.12,14,16,21 A complete distal biceps tendon rupture is readily diagnosed, and repair has been shown to provide excellent relief of pain and return of strength postoperatively2,16 compared with nonoperative treatment,19 with multiple techniques being reported for repair. In contrast to complete ruptures, partial tears of the distal biceps tendon are more difficult to diagnose but are a cause of antecubital pain and weakness with supination and flexion. The reports in the literature on partial tears also support surgical treatment after
Failed conservative management after repair are well reported in the literature; the most common are lateral antebrachial cutaneous nerve injury, radial nerve injury, and heterotopic ossification.\textsuperscript{5,12,15} Re-rupture after primary repair, of complete and partial tears, is a potential complication that has little mention in the current literature. We are not aware of any published investigation dedicated to ascertain the failure rate in a large cohort of surgically treated patients. The primary goals of this study were to report on the failure rate for primarily repaired partial and complete distal biceps tendon ruptures at a single institution, to document the final outcome of such patients, and if possible to identify when the risk for re-rupture is greatest. A secondary goal was to better define the percentage of women that this injury affects. To our knowledge, these have never been described in the literature.

Materials and methods

A search of the medical-surgical patient database was performed to identify all patients who underwent distal biceps repair by any surgeon at our institution between the dates of January 1, 1981, and May 31, 2009. All surgical reports were reviewed along with follow-up clinic notes. Exclusion criteria included the use of an allograft and a procedure that was a revision. Additional exclusion criteria included patients younger than 18 years at time of repair, initial tear due to an infection, surgery performed on an intramuscular or intratendinous tear, incomplete follow-up, and patient unwilling or unable to participate.

A minimum follow-up of 12 months was required to be included in the study. Surveillance consisted of a repeated examination by a physician at our institution or elsewhere. Those without adequate documentation were contacted personally by the junior investigator, who did not participate in any of the surgeries; both phone verbal consent and HIPAA (U.S. Health Insurance Portability and Accountability Act) authorization forms were obtained from all patients with whom direct communication was necessary. The contacted patients were asked if they had experienced a re-rupture of the distal biceps tendon or had any repeated surgery performed on the elbow, for any cause, at an outside institution.

Demographic information included sex, age at surgery, date of surgery, type of tear (i.e., partial or complete on the basis of operative reports), technique of repair, and documented complications, specifically assessing for re-rupture and how it was treated.

The postoperative management varied throughout the study because of the long period included in the study and the number of surgeons involved. In the earlier years, patients were treated with casting for 4 to 6 weeks postoperatively and then began range of motion per the individual surgeon’s protocol. This evolved over time to a more aggressive rehabilitation protocol allowing patients to actively and actively assist move the elbow almost immediately after surgery. Therefore, it was difficult to correlate the postoperative rehabilitation protocol to outcomes or complications. The one consistent feature of all the postoperative protocols was that the patients were instructed in non-weight bearing of the operative extremity for 6 to 8 weeks postoperatively.

Results

The database search returned a total of 234 distal biceps repairs in 219 patients. All patients who underwent distal biceps repair for either a complete or partial tear were included in this investigation. Five biceps repairs in 5 patients were excluded because of supplemental use of an allograft. Also excluded were 36 biceps repairs in 34 patients because of inadequate follow-up in spite of at least 3 attempts to contact the patient in each instance. In addition, 3 patients were deceased from unrelated causes and excluded from this report.

The remaining 177 patients with a mean age of 48 years (range, 30-83 years) with 190 distal biceps ruptures constituted the study population. Of the 177 patients who met inclusion criteria, adequate follow-up of 12 months or more was identified in 150; therefore, only 27 patients had follow-up conducted by phone interview. One of the 13 bilateral repairs was performed simultaneously in the same anesthetic setting, whereas the others were sustained and repaired on separate occasions. There were 5 women with 6 ruptures. Follow-up ranged from 12 to 321 months, with a mean follow-up of almost 9 years (106 months).

All repairs were performed by consultant surgeons who are board certified/eligible in orthopedics and trained in elbow surgery. A total of 15 different surgeons were included in the study; 4 surgeons performed 158 of the repairs (83%). Of the 190 repairs, 172 (90.5%) were repaired by the Mayo modification of the Boyd-Anderson 2-incision technique (Fig. 1), as described by Morrey et al in 1985.\textsuperscript{16} Seventeen (9%) of the tears (all partial) were repaired with a single dorsal-lateral incision,\textsuperscript{13} and one (0.5%) was repaired with an endobutton technique.\textsuperscript{23} There were 131 complete ruptures of the distal biceps tendon and 59 partial tears. The modified Boyd-Anderson 2-incision technique was used for all complete tears except one and for all partial tears, other than the 17 repaired with a single dorsal-lateral incision. The only endobutton repair was used for a complete tear.

Complications

There were 29 (15%) total complications among those 190 cases with completed follow-up not including re-ruptures. Of those, 9 were temporary radial nerve palsies, all of which resolved; 2 patients had continued pain requiring débridement; 3 patients had heterotopic ossification after a repair by the Mayo modified 2-incision technique that required resection; 9 patients had temporary lateral antebrachial cutaneous nerve palsies, all of which completely resolved; 1 patient had reflex sympathetic dystrophy, which also completely resolved; and 5 patients had wound complications (1 deep infection, 4 superficial complications). A total of 8 of the 29 complications required repeated surgery (2, débridement of adhesions; 3, excision of heterotopic ossification; and 3, débridement of the wound secondary to
infection). Of note, there was one re-injury in a 57-year-old paraplegic man who underwent primary 2-incision repair and sustained a fall out of his wheelchair within 1 week of surgery. This fall caused a rupture at the myotendinous junction, not at the prior surgical insertion site, that necessitated further surgical repair.

A total of 3 re-ruptures (1.5%) of primary repairs were identified from the 190 primary repairs investigated. All re-ruptures involved repairs with the Mayo modified Boyd-Anderson 2-incision technique. They all occurred, and underwent repeated repair, within 3 weeks of the index surgery. The repeated repairs were all performed by the original board certified/eligible consultant surgeon at our institution. These 3 cases are briefly summarized.

Re-rupture No. 1 occurred in a 52-year-old man. After completion of his left distal biceps repair, he was being awoken from general anesthesia and had a violent episode during his arousal and forcefully extended his arm. At that time, a “pop” was heard, and examination showed that he had a recurrent deformity. He was immediately placed back under general anesthesia and the repair was repeated, after which he had an uneventful postoperative course. At 38 months postoperatively, the patient reported no issues.

Re-rupture No. 2 took place in a 45-year-old man who began to shovel snow using his right operative extremity, against medical advice, within 7 days postoperatively. He underwent revision repair 14 days after the index surgery and was casted for 3 to 4 weeks because of his previous noncompliance with postoperative restrictions. He was observed for 63 months after the revision and had excellent active motion and use of the extremity.

Re-rupture No. 3 occurred in a 24-year-old man who underwent a right distal biceps repair and was progressing well postoperatively until he had an episode of “violent sneezing” in which he actively and suddenly contracted his operative biceps 2 weeks after surgery. He immediately noticed pain and deformity in his elbow and presented for evaluation. He was found to have a re-rupture (Fig. 2) and underwent revision surgery at postoperative day 20. After the revision repair, he sustained a radial nerve palsy, which resolved without residual deficit. He was observed for a total of 14 months postoperatively and was happy with his outcome at final follow-up.

Discussion

In 2000, Kelly et al\textsuperscript{12} discussed complications of repairs with a modified 2-incision technique. Since that article, many authors have discussed their outcomes of distal biceps repairs by multiple different methods of repair with mention of complications including re-rupture,\textsuperscript{5,12,15} but none have reported the incidence of re-rupture in a large series of patients. Most of the reports of re-rupture are case reports or case series.

Cohen\textsuperscript{7} discussed complications being due to inadequate initial attachment, patient noncompliance in the early postoperative period, or excessive tension on the repair. Mark Morrey et al\textsuperscript{17} showed that repairs performed in high flexion greater than 60° perform well with a low rate of complications including only one re-injury (this patient is included in our series as the re-injury in the paraplegic patient).\textsuperscript{1} These findings show that repairs, even with considerable tension, are well tolerated.

In 2005, Cheung et al\textsuperscript{6} reported on a series of 21 patients who underwent Mayo modified Boyd-Anderson 2-incision repair with an immediate range of motion protocol and found one re-rupture. This was attributed to “noncompliance” as the patient admitted to doing “a high-demand activity.” Other authors have reported failures of suture repair by the modified Boyd-Anderson technique. Bisson et al\textsuperscript{3} described a suture rupture 5 days postoperatively causing the need for repeated repair but did not give details of the event causing the rupture. This was the only re-rupture of 45 cases they reported. Katolik et al\textsuperscript{11} described in their case report a failure of suture repair 3 days post-operatively due to “noncompliance” as the patient lifted his suitcase with his operative extremity.

There are multiple case reports and descriptions of repair failures of endobutton techniques. Naidu,\textsuperscript{18} in 2010, shared a case of endobutton repair in which it loosened and the interference screw had backed out into the soft tissues. This was revised with another endobutton in a different position. A case report by Desai\textsuperscript{8} discussed another endobutton failure due to a fall on ice 7 days postoperatively. Intraoperatively, the suture was found to have failed, and the tendon retracted. This was also revised with another endobutton for repair. Peeters et al\textsuperscript{20} reported on their outcomes in 26 patients all repaired with endobuttons. They described 3 cases of
malpositioning of the endobutton postoperatively, with only one of them showing signs and symptoms suggesting failed reattachment, but no further procedures were performed on this case. It was unknown if the malpositioning was present immediately postoperatively or occurred during the postoperative course. A report of a proximal radius fracture through one of the drill holes used for repair was described by Badia1 after the patient sustained a fall during the early postoperative period.

A 2011 level I investigation by Grewal et al10 compared the outcomes of single- vs double-incision techniques. In this study, 90 patients underwent an acute repair, with 4 re-ruptures reported. All of the repeated injuries were due to “noncompliance or reinjury during the early postoperative period,” which is in alignment with the findings of our study.

This study describes the largest cohort of patients who have undergone a primary repair of a distal biceps rupture. We found 3 re-ruptures (1.5%) in the 190 repaired. All the failures occurred with the use of a Mayo modified Boyd-Anderson 2-incision suture repair. Also, we had a total of 6 of 190 distal biceps ruptures that occurred in women (3.2%). One of these women sustained bilateral distal biceps ruptures. Four of the 6 injuries in women were partial injuries. Partial ruptures occurred statistically more frequently in women than in men ($P = .05$). Thirteen patients (12 men, 1 woman) sustained bilateral injuries (7.3%).

Strengths of our study are the large size of the patient population and a relatively low rate of patients lost to follow-up (19%). We have a long length of follow-up averaging approximately 9 years (106 months) that provides information on possible late re-rupture, which did not occur in our experience. We also had a relatively homogeneous surgical technique during this study period.

Our study does have weaknesses, some of which are inherent to the retrospective nature. We did have 42 patients (with 44 distal biceps ruptures) lost to follow-up who may have had complications, including re-rupture. In addition, the postoperative protocol was varied among the study period, which may have changed the outcomes.

**Conclusion**

This is the first description in the literature to investigate the incidence of distal biceps repair failure after primary repair. We found that the re-rupture rate is 1.5%, and these failures occurred in the immediate postoperative period of 3 weeks entirely because of patient compliance and excessive force across the fresh repair. We also document the incidence in women to be 3.2%, with a statistically increased likelihood of sustaining partial ruptures. These findings, along with the 7.3% incidence of bilateral injuries, have not been previously reported to our knowledge. Finally, because all re-ruptures occurred early, the practical insight of this experience is to protect the patient for at least 3 weeks or more before engagement in any kind of strenuous activity.

**Disclaimer**

Joaquin Sanchez-Sotelo receives consultancy fees and royalties from Stryker, Biomet, DePuy, and Zimmer. Bernard Morrey is Medical Director of Tenex Health; he receives royalties from SBC.

**References**


