

Distal Biceps Tendon Repair: An Analysis of Timing of Surgery on Outcomes

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Context: Surgical repair of the ruptured distal biceps brachii tendon is an effective treatment in injured patients. Timing of surgery is considered an important factor when managing these patients.

Objective: To compare our outcomes after distal biceps tendon acute (at 4 weeks or less) or chronic (greater than 4 weeks) repair.

Design: Cohort study.

Setting: Clinical practice.

Patients or Other Participants: Of 18 patients in a tertiary practice who underwent distal biceps repair, 12 and 6 underwent acute or chronic repair, respectively. The average durations from injury to surgery were 15.3 (range, 9 to 25) and 50.1 (range, 29 to 75) days for the acute and chronic groups, respectively.

Intervention(s): Distal biceps tendon repair.

Main Outcome Measure(s): Disabilities of the Arm, Shoulder and Hand (DASH) scoring, range of motion, and clinical and radiographic complications.

Results: No differences were noted between the groups in DASH scoring or range of motion. No complications occurred, and radiographic outcomes were satisfactory, without evidence of heterotopic ossification in any patients.

Conclusions: Secure repair of a distal biceps tendon injury may yield similar results, whether it is performed in the acute or chronic setting.

Key Words: upper extremity, elbow, DASH, outcomes, chronicity

Key Points

- In these patients, chronic repairs (performed more than 4 weeks after injury) and acute repairs (performed 4 weeks or less after injury) of distal biceps tendon rupture resulted in similar function and range of motion after 1 year.
- No complications occurred, and radiographic outcomes were satisfactory.

Distal biceps tendon injury is rare, representing only 3% of biceps ruptures.¹ It most frequently occurs in active male laborers after an eccentric load on a flexed elbow.² Patients typically present with ecchymosis and swelling about the antecubital fossa and tenderness about the biceps tuberosity. Loss of bicipital forearm torque due to biceps tendon rupture results in significant loss of supination and flexion strength.³ Therefore, surgical repair has been advocated when possible.^{3,4} Many different repair techniques have been described with good outcomes.^{3,5–8}

Early repair (performed at 4 weeks or less after injury) has been recommended and is believed to prevent potential complications and poorer outcomes due to tendon retraction, scarring, and the need for more extensive dissection.⁷ However, these advantages have not been clearly borne out in the literature. For myriad reasons, patients present at variable time points after injury, so it is important to understand the results after late repair. Our aim was to compare outcomes after acute and chronic repairs, using a 2-incision technique, in a consecutive group of patients. Our hypothesis was that chronic repairs would result in inferior outcomes compared with acute repairs.

METHODS

After institutional board review approval, we performed a retrospective search to identify all patients with distal biceps ruptures. All patients were operated on by the third author (J.A.A.), a fellowship-trained shoulder and elbow surgeon, using a 2-incision technique. Inclusion criteria were objective loss of function on clinical examination, distal biceps tendon rupture as seen on magnetic resonance imaging (MRI; routinely performed in all patients with suspected distal biceps tendon rupture at our institution as a means of accurate surgical planning), and minimum of 1-year follow-up. Patients were excluded if they had concomitant bony or soft tissue elbow injury at the time of presentation or less than 1 year of follow-up.

Acute repairs were defined as those performed at 4 weeks or less after injury and *chronic repairs* as those performed after 4 weeks.⁷ All patients underwent repair using the modified Morrey 2-incision technique, which is different from the originally described method in that it uses a burr to create a defect in the biceps tuberosity through which the tendon is passed.³ This technique is commonly performed with satisfactory results. However, the risk of increased heterotopic ossification is reportedly increased with this technique. We therefore prescribe a 6-week regimen of

Table 1. Demographics Characteristics

Variable	Group, Mean $\pm$ SD			P Value ^a
	Total (n = 18)	Acute (n = 12)	Chronic (n = 6)	
Age, y	47.6 $\pm$ 7.7	44.9 $\pm$ 7.8	48.1 $\pm$ 18.6	.891
Time between injury and surgery, d	26.9 $\pm$ 20.3	15.3 $\pm$ 6.0	50.1 $\pm$ 18.6	.005
Follow-up, mo	23.7 $\pm$ 11.5	25.3 $\pm$ 12.8	25.3 $\pm$ 12.8	.365
Injury Side				
Dominant	14/18	9/12	5/6	.999

^a Acute versus chronic group.

indomethacin (75 mg daily) to prevent this complication.^{9,10} Due to reports of radial nerve injury with the single-incision technique, the 2-incision technique is our method of repair.^{11,12}

A similar rehabilitation protocol was used in all patients, with formal sessions 3 times per week. This protocol consisted of splint immobilization with elevation and icing for 1 week, followed by progressive, passive elbow range-of-motion (ROM) exercises for 2 weeks to achieve 30° of extension to 130° of flexion. During this time, the elbow is iced after exercise sessions to minimize swelling and promote wound healing. Motion is encouraged, with the sling worn for comfort only. Over the next 3 weeks, passive exercises are continued to achieve full elbow ROM (flexion, extension, pronation, and supination). At week 6, active ROM is begun. At week 10, progressive strengthening is initiated, with the goal of lifting 20 lb (9 kg) at 5 months independently with the affected arm. All patients were compliant with our postoperative protocol. Rehabilitation regimens were similar for all patients, but the sessions were performed at different locations and by different groups based on patient preference and proximity to home.

Results after acute and chronic repairs were compared. Outcome measures consisted of clinical examination, ROM measurements using a goniometer, and radiographic follow-up. All ROM measurements were recorded by the same independent evaluator. Postoperative radiographs were taken at 3 months, when heterotopic ossification, if present, should be evident.

Disability of the Arm, Shoulder and Hand (DASH) scores were obtained on all patients at final follow-up. The DASH instrument consists of 30 self-reported questions that assess patients with upper extremity dysfunction; the maximum score is 100, and lower scores correspond with better function.¹³

Statistical Analysis

Descriptive statistics were calculated. Differences between acute and chronic groups were assessed with the Mann-Whitney U test for continuous variables. The Fisher exact test was used to assess differences between groups when the variable of interest was dichotomous. All statistics were calculated with SPSS (version 16.0; SSS Inc, Chicago, IL).

RESULTS

A total of 18 patients met our criteria and were included in the study. All biceps tendon ruptures were diagnosed on physical examination and confirmed on MRI. Demographic characteristics are summarized in Table 1. Twelve patients (67%) were treated acutely (at 4 weeks or less) and 6 (33%) were treated chronically (more than 4 weeks after injury). No differences were noted between groups in age or dominant versus nondominant-side injury. As expected, time from injury to surgery was different between groups. (Table 1) All patients were high-functioning, active males. Acute repair was proposed for all patients; however, the timing of surgery was prolonged in the chronic group due to late presentation in 3 patients and work or personal reasons in 3 patients.

In terms of outcomes, no differences were noted for DASH score or ROM in all planes (Table 2). No complications occurred in either group. All patients returned to their previous level of activity and employment in similar time frames. No differences were observed in dominant- versus nondominant-side injury.

DISCUSSION

Although options to treat patients with distal biceps tendon ruptures continue to evolve, the optimal timing of surgery has not been clearly defined. Most surgeons advocate early repair to avoid potential pitfalls due to tendon scarring and retraction. Acute repairs have been defined as taking place at 4 weeks or less from injury. This study represents an attempt to objectively assess whether timing of surgery affects outcomes when performed using similar techniques by a single surgeon.

Elbow motion was satisfactorily restored in almost all planes. The patients treated after 4 weeks did not demonstrate worse elbow function at 1-year followup. No patients developed heterotopic ossification, which can lead to stiffness. This finding is contrary to the report¹⁴ of heterotopic ossification as a notable complication after 2-incision distal biceps tendon repair.

Table 2. Outcomes by Timing of Surgery for Distal Biceps Tendon Repair

Variable	Group, Mean $\pm$ SD			Mean Difference, Acute Versus Chronic Group	P Value
	Total (n = 18)	Acute (n = 12)	Chronic (n = 6)		
Return to full activity, mo	5.6 $\pm$ 1.8	5.9 $\pm$ 2.0	5.0 $\pm$ 0.9	0.8	.240
Final Disabilities of the Arm, Shoulder and Hand (DASH) score	4.4 $\pm$ 7.1	3.1 $\pm$ 3.3	6.8 $\pm$ 11.4	3.7	.467
Final extension, °	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0	0.0 $\pm$ 0.0	0.0	.999
Final flexion, °	153.1 $\pm$ 11.6	153 $\pm$ 12.0	153.3 $\pm$ 12.1	0.4	.946
Final pronation, °	79.0 $\pm$ 9.8	78.5 $\pm$ 9.6	80 $\pm$ 11.0	1.5	.782
Final supination, °	79.3 $\pm$ 10.0	78.9 $\pm$ 10.0	80.0 $\pm$ 11.0	1.1	.843

As for functional outcomes, DASH scores were similar between the acute and chronic groups, a result that compares favorably with reports in the literature. A systematic review² of distal biceps tendon repair outcomes at 1 year yielded an average DASH score of 37. We noted mean DASH scores of 3.1 and 6.8 in the acute and chronic groups, respectively.

In our acute and chronic patient cohorts, no significant complications were noted. All patients returned to previous activity and employment in similar time frames.

Our study has several limitations. It is retrospective and subject to the inherent weaknesses of such research. As a result of strict inclusion criteria, our patient population was small. It is possible that with a larger patient cohort, changes will become evident. Therefore, we cannot make definitive conclusions. Restoration of strength after distal biceps tendon repair has been well documented in the literature,^{2,3} so we focused on ROM and functional analysis using the DASH questionnaire. However, it is possible that elbow strength might suffer in the setting of chronic repair.

In conclusion, our results, although from a small patient cohort, suggest that chronic repairs (occurring after 4 weeks) may yield similar results to those performed in the acute setting in terms of function and ROM. The choice of repair technique should be individualized by patient presentation and surgeon experience. A larger sample population is needed, but we hope this study serves as an impetus for further research.

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