

Bilateral Distal Biceps Tendon Ruptures

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Purpose To determine the incidence of bilateral distal biceps tendon ruptures.

Methods A retrospective review of 321 patients who underwent operative repair of a distal biceps tendon rupture between 1988 and 2010 identified 26 patients with bilateral ruptures. We recorded patient age, mechanism of injury, time between symptom onset before the first surgery and subsequent contralateral symptoms, and time between surgeries.

Results Twenty-two bilateral ruptures were confirmed intra-operatively, 3 by MRI, and 1 was lost to follow up. A total of 23 bilateral ruptures (92%) occurred in men. The average age at the initial rupture was 44 years (range, 29–74 y). The average age at subsequent rupture was 48 years (range, 36–79 y). Excluding the 2 women (age 72 and 79 y), the average age at the initial rupture was 42 years and the average age at subsequent rupture was 46 years. The average interval between ruptures was 4.1 years (range, 0.8–13.9 y). The initial rupture occurred in the dominant extremity in 12 cases (50%) and in the nondominant extremity in 10 cases (42%); in 3 patients (8%) the dominance was not documented or ambidextrous. Thirty-three percent were heavy laborers, 3 patients had a smoking history, and 1 patient reported a history of steroid use. Twenty-two patients (88%) had the second side repaired, where we noted that 12 (55%) of the second tendon ruptures were partial tears.

Conclusions The 8% cumulative incidence of bilateral biceps tendon ruptures in a consecutive series of biceps tendon repairs may be higher because not all patients were contacted, which introduced a sampling bias. This 8% rate is markedly higher than the reported rate of 1.2 per 100,000 for an isolated distal biceps tendon rupture. This implies that patients with a distal biceps tendon rupture are at risk for a rupture on the contralateral side. (*J Hand Surg* 2012;37A:120–123. Copyright © 2012 by the American Society for Surgery of the Hand. All rights reserved.)

Type of study/level of evidence Prognostic III.

Key words Biceps, bilateral, distal, incidence, rupture, tendon.

DISTAL BICEPS TENDON RUPTURES are thought to develop after a sudden eccentric load that causes either a complete or partial tear. Clinically, the tear presents with acute pain. Depending on the extent of the tear, the patient may also have ecchymosis, swelling, weakness in flexion and supination, a palpable defect in the antecubital fossa, and proximal

migration of the biceps muscle belly. Distal biceps tears have a bimodal distribution. They usually occur in men at an average age of 47 to 50 years and follow a sudden eccentric load.^{1,2} Distal biceps tendon ruptures in women occur later in life, are commonly partial, and frequently have an insidious onset.³

Distal biceps tendon tears represent 3% of all biceps tears and have an incidence of 1.2 per 100,000 patients.¹ Bilateral ruptures occur even less frequently and are represented in scattered case reports and small case series.^{4–9} Our goal was to evaluate a large series of operatively confirmed distal biceps tendon tears to identify the incidence of bilateral ruptures.

MATERIALS AND METHODS

Our local institutional review board approved the study. We performed a retrospective review of the distal bi-

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TABLE 1. Patients With an Intraoperatively Confirmed Distal Biceps Tendon Rupture

	High-Grade Partial Tear (>50%)	Low-Grade Partial Tear (<50%)	Partial Tear (Unspecified)	Complete Tear	Acute Tear (Surgery Within 4 wk of Symptoms)	Chronic Tear (Surgery >4 wk After Symptoms)
Initial biceps tendon rupture	3	1	1	17	14	8
Subsequent biceps tendon rupture	5	5	2	10	10	12

Tears are broken down into those sustaining partial versus complete and acute versus chronic distal biceps tendon ruptures.

TABLE 2. Gender Distribution of Bilateral Distal Biceps Tendon Tears: Partial Versus Complete

	Females	Males
High-grade partial initial tear	2	1
High-grade partial subsequent tear	1	4
Low-grade partial initial tear	0	1
Low-grade partial subsequent tear	0	5
Partial (not specified) initial tear	0	1
Partial (not specified) subsequent tear	1	1
Complete initial tear	0	17
Complete subsequent tear	0	10

ceps tendon repairs performed by the senior author (B.M.L.) at a single institution between 1988 and 2010. Of the 321 patients who underwent operative repair of a distal biceps tendon rupture, 26 subsequently presented with signs and symptoms of a contralateral distal biceps tendon rupture. At the time of initial presentation, none of the 321 had a history of a previous tendon rupture. We recorded demographics, including patient's age, the mechanism of injury, the time between the first injury and onset of symptoms for the contralateral injury, and the time between the injury and surgery (acute versus chronic tears) (Tables 1, 2).

RESULTS

Of 321 patients, 22 subsequently sustained a contralateral distal biceps tendon rupture that was confirmed by intraoperative evaluation. Three additional patients had complete or partial biceps tears diagnosed by magnetic resonance imaging (MRI) evaluation but elected non-operative management. One additional patient with a clinical history and examination consistent with a contralateral complete distal biceps tendon tear was excluded from the study because he was lost to follow-up before the diagnosis could be confirmed by MRI or

surgery. A total of 25 patients with MRI-diagnosed or operatively confirmed biceps tendon ruptures out of 321 total patients represents an incidence of 8% for bilateral ruptures in this series.

Of the 25 bilateral tendon ruptures, 23 occurred in men and 2 occurred in women. The initial rupture occurred in the dominant extremity in 12 patients. In 3 patients, hand dominance was either unknown or documented as ambidextrous. The average age at the initial rupture was 44 years (range, 29–74 y) and the average age at the time of contralateral rupture was 48 years (range, 36–79 y). Excluding the 2 female patients (age 72 and 79 y) from the analysis, the average age at the initial rupture was 42 years and the average age at subsequent rupture was 46 years. The average interval between ruptures was 4.1 years (range, 0.8–13.9 y) as measured from the time of the initial injury to the time of the subsequent patient presentation for a contralateral biceps tear.

Of the patients who sustained bilateral tendon ruptures, 8 (33%) were heavy laborers. Three patients had a smoking history and 1 patient reported using an anabolic steroid.

Intraoperative evaluation established that of the initial biceps tears, 17 were complete, 3 were high-grade partial tears (more than 50% of the tendon ruptured from the biceps tuberosity), and 1 was a low-grade partial tear (50% or less of the tendon ruptured from the biceps tuberosity). One was documented as a partial tear without enough descriptive detail to classify it as a high- or low-grade tear.¹⁰ We classified the subsequent contralateral distal biceps tears as complete in 10 patients, high-grade partial in 5 patients, low-grade partial in 5 patients, and partial without enough documentation to classify it as either a high- or low-grade tear in 2 patients.¹⁰ In the initial distal biceps tendon tears, 14 were acute (receiving surgery within 4 weeks of initial onset of symptoms) and 8 were chronic (receiving surgery more than 4 weeks after initial onset of symp-

toms). In the subsequent contralateral distal biceps tears, 10 were acute and 12 were chronic.

DISCUSSION

Numerous case reports and small case series report the occurrence of bilateral distal biceps tendon tears. Iwamoto et al⁵ presented a series of 3 bilateral ruptures in 23 patients. The tendon ruptures in these 3 patients were all confirmed intraoperatively. The interval between ruptures was 4.6 years and the average age at subsequent rupture was 49 years.

Schneider et al⁴ collected 25 patients from a retrospective chart review with operatively confirmed bilateral ruptures of the distal biceps tendons. Ten patients were available for a follow-up evaluation. The researchers noted a tendency for the patients with bilateral tendon ruptures to be middle-aged men who had a higher rate of nicotine use and anabolic steroid use than the general population.

Multiple case reports in the literature have documented the occurrence of bilateral distal biceps tendon ruptures. Bayat et al⁶ reported a case of simultaneous bilateral distal biceps tendon ruptures in a rock climber. Rokito and Iofin⁷ described bilateral ruptures in a patient performing resisted biceps flexion exercises with the elbow in supination. Ikebukuro⁸ reported biceps tendon ruptures in a mechanic on the left side at age 36 and the right side at age 47, both from lifting injuries. Visuri and Lindholm⁹ identified a 23-year-old bodybuilder who began using anabolic-androgenic steroids at the age of 17. He sustained his first distal biceps tendon rupture in the dominant right arm after lifting a heavy rack. After operative reattachment of a complete tear, he resumed bodybuilding; 8 months later after hitting a heavy bag, he felt a snap in the left arm. Surgery confirmed a distal biceps tendon tear.

Our large case series of distal biceps tendon ruptures established a cumulative incidence of 8% for the contralateral rupture. This incidence may be limited in accuracy because it represents only the number of patients who returned for evaluation. Patients who may have had symptoms of a contralateral rupture but did not seek medical treatment or may have sought treatment elsewhere cannot be included. The calculation also does not include patients who did not recognize a contralateral rupture and thereby were not evaluated for it. As a result, our incidence is a threshold and likely represents a minimum incidence. The actual incidence of bilateral distal biceps tendon ruptures is probably higher.

Our incidence calculation is significant ($P < .05$ with 95% confidence intervals) compared with the frequently quoted incidence of 1.2 per 100,000 distal biceps tendon ruptures.¹ The difference between the incidence of an isolated distal biceps tendon rupture and the incidence of a bilateral distal biceps tendon rupture suggests that an intrinsic vulnerability predisposes the tendon to injury. There are multiple theories that attempt to explain the etiology of distal biceps tendon ruptures. Chevallier¹¹ suggested that tearing of the distal biceps tendon occurs in 2 stages. The first stage represents incomplete tears as a result of pre-existing pathological changes within the tendon. The rupture is completed in the second stage when a muscle contraction tears the lacertus fibrosus. Davis and Yassine¹² suggested that pathological changes within the distal biceps tendon, and the resultant tearing, resulted from hypertrophic lipping that developed along the anterior margin of the radial tuberosity. Seiler et al¹³ suggested that a hypovascular watershed area of the biceps tendon just proximal to the insertion predisposes the tendon to attritional injury. Microscopic evaluation of the distal aspect of ruptured biceps tendons has shown degenerative changes.¹⁴ Ruptures likely occur in a tendon with preexisting pathological changes. Our study supports the notion that both distal biceps tendons in a single individual may be subject to the same pathologic process.

Distal biceps tendon ruptures are frequently thought to result from a traumatic event. Regardless of the mechanism, our measured increased incidence of bilaterality supports the conclusion that a systemic etiology, chronic tendinosis, or anatomic variant contributes to the development of bilateral tendon ruptures.

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