Complications of Distal Biceps Repair

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KEYWORDS

• Distal biceps • Complications • Repair • Reconstruction

KEY POINTS

- Repair of distal biceps ruptures in active, healthy patients has a high satisfaction rate regardless of technique or approach.
- The total complication rate after repair of the distal biceps tendon is 15% to 35% and is independent of approach; however, anterior-only approaches increased the rate of lateral antebrachial cutaneous nerve palsy.
- The most common complication after distal biceps tendon repair is neurapraxia of the lateral antebrachial cutaneous nerve.
- Other complications include posterior interosseous nerve injury, heterotopic ossification, stiffness, weakness, wound infections, complex regional pain syndrome, re-rupture, median and ulnar nerve injuries, brachial artery injury, proximal radius fracture, and hardware failure.
- Repairs using suture anchors or transosseous screws have a higher rate of re-rupture. Chronic repairs performed with the elbow in a flexed position do not lead to an increased rate of stiffness.

ANATOMY

The biceps brachii is a diarthrodial muscle, which acts as a powerful forearm supinator. The muscle is located in the anterior compartment of the arm and is innervated by the musculocutaneous nerve. As the name implies there are 2 heads of the biceps brachii, short and long. The short head originates from the coracoid tip, whereas the long head originates from the supraglenoid tubercle and/or superior labrum. The distal biceps tendon can be found in the antecubital fossa between the brachioradialis and the pronator teres. The tendon courses distally and inserts onto the radial tuberosity 23 mm distal to the articular cartilage of the radial head. The footprint on the radial tuberosity measures 21 mm by 7 mm and is located on the posterior ulnar surface, with the short head inserting more radial and distal to the proximal and ulnar long head (**Fig. 1**).[1–3] A secondary attachment includes the lacertus fibrosis, which attaches medially to the deep fascia of the anterior compartment and may prevent retraction of the ruptured distal biceps tendon.

BACKGROUND

Ruptures of the distal attachment of the biceps brachii are a rare injury with a reported rate of 1.2 per 100,000 patients or 2.55 per 100,000 patient-years. Ruptures typically occur in the dominant arm of men in the fourth or fifth decade of life.[4,5] Patients report an eccentric extension load on a flexed elbow followed by a pop with pain, swelling, and ecchymosis in the region of the antecubital fossa. Frequently, patients present with anterior arm pain and weakness with elbow flexion and supination and a deformity secondary to retraction of the biceps.

NONOPERATIVE TREATMENT

Nonoperative treatment includes early range of motion and advancement to resistive exercises

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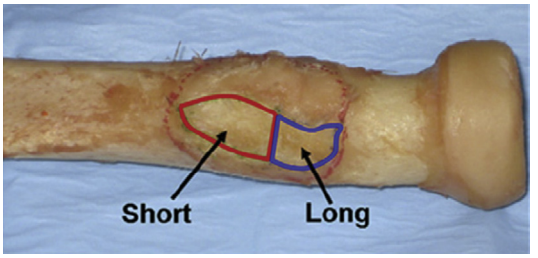

Fig. 1. Cadaver specimen with the short and long head insertions mapped out with red and blue ink. Note that the short head inserts distal to the long head and occupies a larger area. (*From* Jarrett CD, Weir DM, Stuffman ES, et al. Anatomic and biomechanical analysis of the short and long head components of the distal biceps tendon. J Shoulder Elbow Surg 2012;21:942–8; with permission.)

and functional rehabilitation within 4 weeks of injury. Nonoperative treatment leads to acceptable functional outcomes in sedentary or low-demand patients. However, active patients generally are limited by a decrease in supination strength and endurance of 21% to 55% and 86%, respectively. Elbow flexion strength is also decreased by 8% to 13%, and endurance is decreased by 62% in nonsurgically treated patients.[6–8] As a result of this decrease in function, surgical repair is commonly recommended for young active patients.[9]

OPERATIVE TREATMENT

Current indications for distal biceps repair include full-thickness tears or partial-thickness tears, which have failed conservative treatment in active, healthy, compliant patients who desire full strength and endurance. Nonanatomic and anatomic repairs have been described. Nonanatomic repairs in which the biceps is repaired to the brachialis reconstitutes the contour of the biceps muscle; however, nonanatomic repairs do not restore supination strength or biceps endurance power. Contemporary techniques utilize either 1 or 2 incisions. A variety of fixation devices have been described that facilitate strong repairs.[10–29]

Before 1961, operative treatment was fraught with complications with a rate of radial nerve injury close to 15%. In 1961, the Boyd-Anderson 2-incision technique was proposed for the anatomic repair of the distal biceps tendon in order to reduce the incidence of radial nerve palsy. This technique used an anterior incision to retrieve and deliver the distal biceps tendon to a posterior incision where the biceps is repaired to the exposed biceps tuberosity. Exposure of the biceps tuberosity posteriorly required subperiosteal elevation of the anconeus, which led to a high rate of heterotopic ossification (HO) and synostosis.[6,30] Using this technique, Karunakar and colleagues[30] demonstrated that 66% recovered strength and endurance of supination and flexion with no radial nerve palsies.

Although patient satisfaction remained high, the Mayo modification of the 2-incision technique has been described to perform a muscle-splitting approach through the extensors in an attempt to prevent HO and synostosis.[15,20,31] Recently, the one-incision technique has been advocated by some surgeons.[10–13,16–18] Proponents of this technique report a decreased rate of HO and synostosis with low rates of posterior interosseous nerve (PIN) injury. Critiques of the one-incision technique include failure to anatomically restore the distal biceps attachment and an increased rate of lateral antebrachial cutaneous nerve (LABC) neuropraxia.[18,32] Although most surgeons agree that repair in active healthy patients is indicated to restore function, currently there is no consensus on whether the one- or 2-incision technique should be used. Recent studies show no difference in complication rates; however, the anterior-only approach is associated with an increased rate of LABC neuropraxia.[18]

RESULTS

Functional results of the operative treatment of distal biceps ruptures are generally favorable with high patient satisfaction rates (>90%). Most studies report greater than 80% recovery of flexion and supination strength and endurance, with some studies reporting increased strength and endurance when compared with the atraumatic contralateral side. Patients must also be counseled on the cosmetic differences between operative and nonoperative treatment. Nonoperative treatment of a retracted ruptured biceps tendon may lead to a change in contour of the anterior arm. Although the contour may be reestablished with operative treatment, scars on the anterior arm may prove to be unsightly for some patients.

GENERAL COMPLICATIONS

Overall complication following with repair of the distal biceps tendon vary, with studies reporting ranges between 0% to 50%. The total complication rate is estimated between 15 and 35%.[33–35] These common complications include neurologic injuries (10%–15%), HO (0%–50%), reruptures (1%–5%), hardware failure (0%–20%), chronic regional pain syndrome (CRPS) (2%), wound problems (2%–30%), stiffness (4%), and