



# Focus On

## Rupture of the distal tendon of the Biceps Brachii

Typically, rupture of the distal tendon of the biceps brachii occurs in men between the ages of forty and sixty years.<sup>1</sup> The mechanism is usually a sudden extension force applied to a flexed and supinated elbow.<sup>2</sup> The incidence of this injury is increasing and now accounts for 10% of all ruptures of the biceps tendon.<sup>1</sup>

### Aetiology

The aetiology of the weakened tendon is probably multifactorial but is likely to represent degeneration in the attachment of the tendon to the radial tuberosity as a result of reduced vascularity, together with repeated mechanical impingement that accompanies rotation of the forearm.<sup>3,4</sup> Smoking and anabolic steroids may further degrade the damaged tendon attachment.<sup>1,5</sup>

### Natural history

An untreated rupture of the distal biceps tendon leads to a 40% loss of strength in supination and a 30% loss of flexion strength of the elbow.<sup>6</sup> In particular, sustained supination power is reduced by at least 50%. There is generally a legacy of discomfort in the antecubital fossa and loss of the normal biceps contour; this can lead to significant dissatisfaction from the patient, especially if the acute injury has been initially missed by an attending physician. For these reasons, operative intervention is generally recommended as soon as conveniently possible and a high index of suspicion should be applied to consideration of the diagnosis on presentation.

### Clinical features

The history of the injury is characteristic. A sudden 'twang' or 'snap' is reported when the flexed elbow is unacceptably challenged, such as if one member of a pair is suddenly left holding the whole weight of a heavy object being lifted by them both. Immediate severe pain follows the mechanical event and considerable swelling and bruising follows over the next few hours. What has occurred is seldom immediately obvious to the sufferer or the attending physician.

A complete rupture with an intact lacertus fibrosus (bicipital aponeurosis), or rarely a partial rupture, will make the diagnosis more difficult. Various clinical tests have been thus described. The biceps squeeze test is analogous to Simmond's test for the Achilles tendon and absence of supination of the forearm on squeezing the biceps indicates a positive test.<sup>7</sup> The flexion initiation test involves attempting to flex the elbow while a ten-pound weight is held in the hand although this may be

impractical in the acutely symptomatic individual.<sup>8</sup> The biceps hook test relates to the inability in ruptured cases to 'hook' the distal biceps tendon from the lateral side as the patient actively supinates with the elbow flexed to 90°.<sup>9</sup> The biceps crease interval is an objectively measurable distance between the antecubital crease and retracted distal edge of the tendon, a value of > 6 cm leading to good diagnostic accuracy.<sup>10</sup> However, the retracted and ruptured tendon is seldom palpable on account of the associated swelling although there is always a defect in the antecubital fossa in complete ruptures. This is quite different to the normal side, especially if the patient attempts resisted flexion and supination of the elbow.

### Investigations

Ultrasonography can quickly and elegantly demonstrate the defect but in equivocal cases magnetic resonance (MR) scanning is more likely to demonstrate the soft-tissue abnormality and is the gold standard investigation in cases of clinical doubt.<sup>11</sup>

### Treatment options

**Acute injury.** There is little controversy that immediate reattachment of the tendon is the procedure of choice. In view of the difficulty and complications of a direct anterior approach, such as a radial nerve palsy, Boyd and Anderson described a dual-incision technique where the tendon is retrieved anteriorly and passed through the forearm bones to be reattached through a posterior approach to the radial tuberosity, exposed by pronation of the forearm.<sup>12-14</sup> Re-attachment is through bone tunnels and direct suture of the tendon to a prepared trough created in the tuberosity. Modifications to this technique were then devised by the Mayo clinic in order to avoid the development of a synostosis created by the bone liberation and periosteal stripping required.<sup>14</sup> The development of improved bone anchors, however, has made the anterior approach easier, safer and more popular and has replaced the dual-incision method in most cases.

**Delayed Presentation.** If a straightforward reattachment of the tendon directly to the radial tuberosity is impossible because of musculotendinous retraction, usually after a one- to three-week delay, non-anatomical replacement has been attempted by suturing the biceps tendon to the brachialis muscle tendon as closely as possible. While studies have shown good recovery of flexion power to the elbow, recovery of supination power, especially with endurance activities, has been substantially reduced by 50%.<sup>15,16</sup>

The development of more sophisticated tendon-to-bone fixation methods has enabled even long-standing ruptures to be repaired anatomically. The knowledge that over time the biceps motor tendon unit will gradually stretch has displaced the need for autograft or allograft methods described by the Mayo clinic and others.<sup>17-21</sup>

In one series of 16 patients, direct repair became possible by applying sustained traction and then undertaking extensive adhesion release with epimysial relaxing incisions to a retracted tendon, with good outcomes.<sup>22</sup>

In another series of five neglected ruptures with a mean time to repair of 77 days, tendon fixation was secured by an anterior approach using the EndoButton (Smith & Nephew Inc., Cambridge, MA) technique with the elbow in full flexion. Post-operatively, immediate mobilisation was permitted leading to near full extension and full recovery of biceps function and power at a mean follow-up of 21.4 months.<sup>23</sup>

**Partial ruptures.** It is not clear whether true partial ruptures of the biceps tendon exist to any great extent. Some authors, however, have reported them and advocated repair in tears involving greater than 50% of the tendon width.<sup>24</sup> Conversion of a partial to a complete tear with reattachment has been reported with good results, improving the persisting weakness that resulted.<sup>25,26</sup>

## Summary

In appropriate patients, immediate anatomical repair of a ruptured distal biceps tendon is required to re-establish the strength of flexion and supination as well as endurance. Early diagnosis is the key to success. A single anterior or a dual Boyd and Anderson incision technique, with similar results, can achieve this. Familiarity and confidence with surgical fixation seems to be the deciding factor as to which method to use. In neglected cases, however, and realising the propensity for the biceps tendon to fully stretch out to almost its original length over time, reattachment is also a possibility.

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