

# TECHNIQUE AND RESULTS AFTER DISTAL BRAQUIAL BICEPS TENDON REPARATION, THROUGH TWO ANTERIOR MINI-INCISIONS

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## ABSTRACT

**Objective:** Evaluation of postoperative results of repair of distal biceps brachii ruptures through a two anterior mini-incisions. **Methods:** Nine patients with clinical and imaging (MRI) diagnosis of total lesion of the biceps brachii at its insertion were operated with a surgical technique with two mini-incisions between 2008 and 2011. The patients were evaluated after three months of evolution and all of them recovered the fully flexion-extension arch. **Results:** Two patients (22.2%) presented a limitation of 20 degrees of supination. One patient (11.1%) had radial nerve palsy, but was totally recovered after five months. In one patient

(11.1%) the muscle remained retracted, but the insertion was recovered. In three patients (33.3%) adhesion was observed on the proximal scar. There was no clinical or radiographic evidence of radioulnar synostosis after six months of evolution. All patients reported satisfaction with the treatment. **Conclusions:** We conclude that the presented method shows good results as well as other techniques, with less risk of adhesion on the flexor fold of the elbow. **Level of Evidence IV, Case Series.**

**Keywords:** Tendon injuries. Tendons/surgery. Surgical procedures, operative/methods. Evaluation studies.

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## INTRODUCTION

The distal biceps brachii tendon rupture is a rare condition with approximate incidence of 1.2 per 100,000 inhabitants per year.<sup>1</sup> Only 3% of the lesions occur at this site, 96% in the long head and 1% in the short head.<sup>1-3</sup> It generally occurs in men between the fourth and sixth decades of life and most often affects highly active individuals and smokers.<sup>1,4</sup> The patients refer to a history of rapid elbow flexion against resistance, where the dominant extremity is the most frequently involved.<sup>1,3,5,6</sup>

In the clinical presentation, patients present acute pain in the cubital fossa accompanied by an audible pop, edema, ecchymosis, palpable defect in the distal trajectory of the tendon with alteration in the relief of the arm and reduced strength in forearm supination and elbow flexion.<sup>5</sup>

Complete avulsion in the radial tuberosity is the most common finding.<sup>7</sup> Several causes were reported in the literature: use of anabolic steroids,<sup>8</sup> diminished vascularization, tendon shock generated by rotation of the radius in relation to the ulna, presence of bone spicules or by the acute edge of the

radial tuberosity, degeneration of the tendon and smoking that causes hypovascularization of the distal region of the tendon.<sup>2,9</sup> Recent studies demonstrate that there is a combination of local anatomical factors and tendon degeneration, contributing to the failure of the distal biceps tendon.<sup>9</sup>

Note in the literature that there has been a tendency for early surgical treatment in distal biceps rupture for several decades<sup>2-4,6,10</sup> on account of the significant morbidity that patients present with the conservative treatment, such as substantial loss of supination and flexion strength and of the resistance of both.<sup>4,6,10,11</sup> A recent study, based on a resistance strength and measurement method, allowed a more sophisticated analysis of the results obtained with nonsurgical treatment, with the following values found: loss from 21% to 55% in supination strength, 86% with loss in supination resistance, loss from 8% to 36% in flexion strength, and loss of 62% in flexion resistance.<sup>12</sup>

Several studies have demonstrated excellent clinical and biomechanical results after surgical repair, therefore most surgeons recommend early repair of lesions, especially in youths and active

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people.<sup>2,4,6,13</sup> However, due to the rate and to the type of complications associated with each technique, there is still controversy about the best surgical approach: one or two incisions, and the fixation technique: bone tunnels, anchors and endobutton.<sup>2</sup> Due to the complications generated by these various surgical techniques, we decided to prepare a technique that consists of the performance of two anterior mini-incisions (the proximal incision on the tendon stump and the distal incision on the edge of the supinator) and the use of an anchor as a fixation method.

## MATERIAL AND METHOD

This study was initially submitted to evaluation by the Scientific Committee of Hospital IFOR and approved for execution. The informed consent forms were consequently drawn up.

Nine male patients were submitted to distal biceps tendon rupture repair surgery in the period from September 2007 to March 2011. The average age was 37.5 years (ranging between the minimum of 23 and the maximum of 52 years). The patients were right-handed, with the right side involved in seven (88.9%) patients while the left was involved in one patient (11.1%). All the patients were operated by the same surgical team.

The study involved patients with a clinical and magnetic resonance imaging (MRI) diagnosis (Figures 1 and 2) of total lesion of the distal biceps at the insertion site and with evolution time of up to three weeks (averaging eight days). As exclusion criteria we used: bilaterality, partial lesion; ruptures located at the myotendinous junction and just below it; and lesions with periodicity of over three weeks.

Tables 1 and 2 present the distribution of operated patients according to age and side affected, respectively.

### Surgical Technique

The patient was anesthetized and placed in a supine position. We used a tourniquet and its average time of use was 60 minutes. The operation was performed through two anterior mini-incisions. The proximal incision (Figure 3) that was approximately 3 cm long was made in the distal third of the arm on the anterior medial surface over the tendon stump. The biceps tendon was isolated and trimmed with two no. 5 Ethibond threads passed through the ruptured portion, entering

at the end of the tendon. An X-shaped suture (Bunnell) or point of blockage (Krachow) was used. The distal incision (Figure 4) was made in the proximal third of the forearm on the anterior surface over the supinator edge (start of the Henry approach measuring 3 cm long). Using curved forceps, the prepared tendon stump was transposed through the bicipital tunnel and



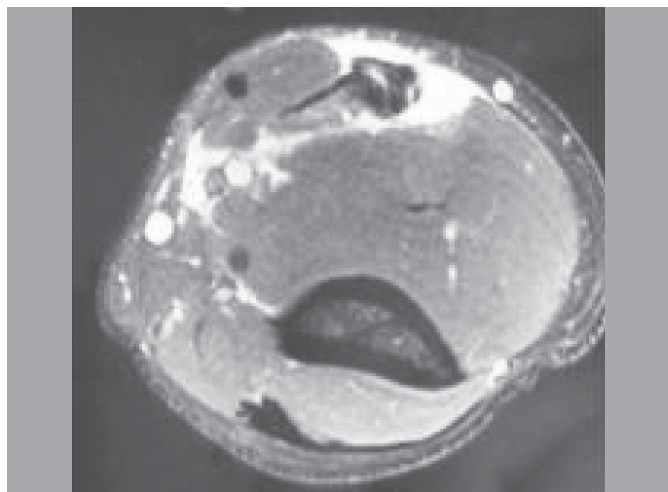
**Figure 2.** Sagittal section of MRI at T2 with distal biceps rupture at its insertion.

**Table 1.** Age of the patients emphasizing the lowest, highest and average age.

Age	Years
Lowest	23
Highest	52
Average	37.5

**Table 2.** Distribution of the patients in relation to the affected side.

Limb	Frequency	%
Right	8	88.9
Left	1	11.1



**Figure 1.** Axial section of MRI at T2 with distal biceps rupture at its insertion.



**Figure 3.** Proximal incision highlighting the biceps tendon stump.

reinserted in the region of the radial tuberosity, then fixed with an anchor with the elbow at 90 degrees of flexion and forearm in supination. After fixation, the limb was immobilized with a plaster cast at 90 degrees of flexion and maintained for three weeks when physiotherapy was initiated.



**Figure 4.** Proximal and distal incision with the stump prepared and already transposed through the bicipital tunnel.

## RESULTS

The patients were evaluated after three months of evolution and they all recovered full flexion and extension (Figures 5 and 6). In two patients (22.2%) there was a limitation of supination at 20 degrees. One patient (11.1%) presented radial nerve palsy, but was totally recovered after five months. There was a decrease in strength in all the patients. In one patient (11.1%) the biceps muscle remained retracted, but the insertion was recovered. In three patients (33.3%) adhesion was observed on the proximal scar. There was no clinical or radiographic evidence of radioulnar synostosis after six months of evolution. All the patients reported satisfaction with the treatment.

## DISCUSSION

The anatomical repair of the biceps tendon has become the procedure of choice for injuries of the distal biceps at its insertion point. Good results have been reported in the vast majority of studies with regards to recovery of supination and flexion.<sup>2,4-6</sup> The various techniques developed over the years were geared towards reducing the complications associated with the repair. Historically, a single anterior incision (volar approach of Henry) still employed today, is used to reattach the distal biceps tendon to the radial tuberosity, improving supination and flexion strength, but due to its extensive exposure, several cases of injury to the radial, median, ulnar and lateral cutaneous nerve of the forearm and palsy of the posterior interosseous nerve were reported due to excessive cutaneous retraction.<sup>10,13</sup> In the attempt to reduce the complications generated by the



**Figure 5.** Total extension. Repair in the right limb.



**Figure 6.** Total flexion. Repair in the right limb.

extensive anterior exposure, Boyd and Anderson<sup>13</sup> developed a technique of two incisions that consists of ulnar exposure, yet this technique has been associated with heterotopic ossification and radioulnar synostosis.<sup>5,6,14,15</sup>

However, the double incision decreases the rate of nerve injuries, but does not eliminate the risk<sup>15</sup> and there are also reports that heterotopic ossification may be present with the single-incision technique through the anterior approach.<sup>16</sup>

Morrey et al.<sup>4</sup> modified Boyd's and Anderson's technique to avoid subperiosteal ulnar exposure in an attempt to reduce the incidence of radioulnar synostosis, performing the dissection between the extensor carpi ulnaris and the supinator, thus minimizing the risk of injury to the posterior interosseous nerve.<sup>17</sup>

The exposure of the radial tuberosity appears to be the main factor in the determination of the type of complication.<sup>10</sup> The single incision technique requires extensive anterior exposure,

which poses a risk to structures such as the median nerve, lateral cutaneous nerve of the forearm and particularly the radial nerve. In our study the fixation was performed with an anchor, which proved to be sufficiently strong to maintain the repair throughout the rehabilitation process. The advantages of using suture anchors are: greater availability in surgical centers, greater familiarity among surgeons and need for less tendon retraction.<sup>18</sup> With regard to the endobutton fixation technique, the advantage is evidenced by the intramedullary placement of the tendon allowing less displacement of the repair and maintenance of bone-tendon continuity.<sup>19</sup> Yet studies show that both techniques provide adequate fixation strength for the repair and for the functional rehabilitation process.<sup>20</sup>

Reinsertion is contraindicated in patients without significant functional damage. This can be observed in the sedentary patient, but this lesion rarely occurs in such an individual.

An attempt to reinsert this tendon, in cases where there is a delay of more than three weeks, needs careful consideration since the tendon is typically retracted in the direction of the bicipital muscle and is not long enough to reach the radial tuberosity. Moreover, the tract from the tendon to the tuberosity will have already healed and will be obliterated, which will make the surgery much more difficult.<sup>4</sup>

In chronic cases in which the distal stump of the biceps tendon cannot be mobilized up to the radial tuberosity, various reconstruction methods were described including the use of fascia lata, semitendinosus tendon, palmaris longus tendon, calcaneal tendon and tendons of the flexor carpi radialis.

## CONCLUSION

The method presents good results as do the other techniques, yet it reduces the risk of adhesion on the flexor fold of the elbow.

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