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ORIGINAL ARTICLE • ELBOW - TRAUMA

Distal biceps section and reinsertion for chronic distal biceps tendinopathy

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Abstract

Background Surgical reinsertion of the distal biceps tendon for acute and chronic tears is a widely accepted procedure, but little is known about surgical treatment of distal biceps tendinopathy.

Methods Twenty patients underwent a surgical procedure for distal biceps tendinopathy after failure of conservative treatment. The surgery was performed through a single incision. The biceps tendon was detached, debrided and reinserted using a ToggleLoc (Zimmer Biomet) device. Clinical and radiologic evaluation was performed after a minimum follow-up of 1 year. Quick-Dash score, Liverpool Elbow Score, Mayo Elbow Performance Index, Broberg and Morrey Score and Short HSS Scoring System were used, and isokinetic testing was performed.

Results The outcome of these five clinical elbow scores showed no clinically relevant differences between the affected and non-affected side. Isokinetic testing of peak torque in flexion and supination showed equal strength between both sides. These results indicate good functional outcome and recovery of flexion and supination, compared to the non-operated side and the normal population.

Conclusion This study demonstrates that distal biceps tendon debridement and reinsertion is a safe and valid option for patients with distal biceps tendinopathy after failure of conservative treatment.

Level of evidence Level 3 retrospective cohort study.

Keywords Distal biceps · Tendinopathy · Surgical repair · Chronic · Reinsertion · Functional outcome

Introduction

Symptomatic distal biceps tendinopathy is a rare condition in which patients present with chronic atraumatic pain in the cubital fossa, exacerbated by (forced) flexion and/or supination [9]. In analogy with other tendinopathies, angiofibroplastic hyperplasia has been suggested as a cause but histologic evidence is missing [8]. Throughout literature, there is an overlap between a true tendinopathy and partial tearing, both clinically and radiographically [26].

Conservative treatment, such as nonsteroidal anti-inflammatory drugs (NSAID), corticosteroid injections, physiotherapy, avoidance of strenuous activities and/or shockwave therapy provide good results in some patients [2, 11], but it is unclear how long this should be pursued [8].

On the other hand, acute distal biceps tendon tears treated with a fixation device technique generally have a good functional outcome [21].

We hypothesized that surgical section, debridement of the stump and reinsertion of the distal biceps tendon, would provide pain relief and improve elbow function in patients with chronic distal biceps tendinopathy. We also hypothesized that this is a safe procedure, comparable with the treatment of acute distal biceps tendon tears.

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Materials and methods

Patient population

Between March 2010 and March 2016, 22 patients were treated operatively for distal biceps tendinopathy in our department. These patients presented with chronic atraumatic pain in the antecubital fossa and had a negative hook test [20]. All patients were initially treated conservatively for at least 3 months with 18 sessions of physiotherapy, a minimum of two sessions ESWT and one or two local corticosteroid injections. MRI was performed in the FABS (90 degrees of elbow Flexion, shoulder ABduction and full Supination) position, allowing visualization of the whole distal biceps tendon insertion on a single image [13]. An increase in signal intensity on T2-weighted imaging sequences with thickening of the tendon confirmed the diagnosis of tendinopathy [14].

When conservative treatment failed, surgery was proposed.

Surgical procedure and rehabilitation

Patients underwent a distal biceps section, debridement and reattachment with the use of a fixation device (TogglLoc—Zimmer Biomet). The procedure was performed by the senior author through a single incision. All surgery was performed without tourniquet and in an outpatient setting.

The radial tuberosity was approached through a longitudinal incision as in the standard Henry approach. Venous branches were ligated when necessary. Throughout the whole procedure, self-retaining retractors were used to minimize the risk of compression or traction injuries to the radial nerve. After section of the distal biceps tendon, the tendinopathy was inspected, and the affected part of the tendon was removed until a strong viable tendon remained. The bicipital aponeurosis (lacertus fibrosus) was identified and sectioned to improve mobilization of the tendon. Two running locking sutures with a non-resorbable wire were attached to the ToggleLoc. After debridement of the radial tuberosity, a guide pin was drilled in the middle of the original insertion, with the forearm in full supination. The thickness of the tendon was measured, and the first cortex was drilled with a drill of the same size. After removing the bone debris, the second cortex was perforated with the ToggleLoc drill. The ToggleLoc was then inserted and flipped on the outer radial cortex in full supination to mimic the anatomical position and to avoid damage to the posterior interosseous nerve. Final fixation was tested intra-operatively by direct visualization and by pulling on the newly attached tendon until the arm was lifted from the operation table. Full range of motion of the elbow was checked intra-operatively. After hemostasis and wound irrigation, routine closure of the wound was performed.

Immediate gentle active and passive range of motion was allowed, and no splints or casts were used. After 6 weeks, progressive biceps muscle toning exercises were initiated under supervision of a physiotherapist. Daily activities without restriction were initiated after 3 months, and sports activities could be resumed after 6 months.

Inclusion criteria and outcome measures

After approval of the local institutional board, all patients without previous elbow surgery, without complete biceps tears and with at least 1-year follow-up were assessed by an independent investigator (SF).

The upper limb function was assessed with Quick-Dash score and four different elbow-specific scores, i.e., Liverpool Elbow Score (LES), Mayo Elbow Performance Index (MEPI), Broberg and Morrey Score (B&M) and Short HSS Scoring System (sHSS) [18]. A certified physiotherapist, under supervision of the independent investigator, measured the peak torque for supination and flexion of both elbows with an isokinetic testing device (PrimusRS, BTE Technologies, Hanover, USA). Supination and flexion peak torques were measured at 60 and 180 degrees per second. Six repetitions were performed, beginning with the uninvolved side, after sufficient warm-up. Average peak torques of both sides were compared.

During the assessment, radiographs of the elbow were obtained to evaluate the position of the ToggleLoc.

Statistical analysis

Statistical analysis was performed with IBM SPSS Statistics for Windows, version 24.0 (Armonk, NY).

We compared the five functional scores, between the operated and the unaffected side, using the Wilcoxon signed-rank test, because clinical outcome scores had a floor or ceiling effect and were not normally distributed. Peak torque measurements (strength), assessed with Shapiro–Wilk statistics, had a normal distribution and therefore were compared with a paired sample *t* test. For all tests, a result was considered statistically significant if $p < 0.05$.

Results

Between April and June 2017, 20 out of 22 patients that met the inclusion criteria were reviewed. Two patients could not be contacted by any means because they were lost to follow-up. Fourteen male patients and six female patients with a mean age of 51.3 years (SD 5.9, range 41–60 years)

were included. All patients but one were right-side dominant. Seven operations were performed on the non-dominant side and 13 on the dominant side. Mean follow-up was 33.2 months (SD 19.6, range 12–63 months). None of the patients needed further treatment.

Six patients remembered experiencing transient paresthesia. In two cases, the superficial radial nerve was involved, and in four patients, the lateral antebrachial cutaneous nerve was involved. At the time of investigation, all paresthesia had resolved.

On a scale between 0 and 10, the mean satisfaction after surgery was 8.65 (range 5–10). There were no wound problems, nor biceps tendon fixation problems.

As assessed in the Liverpool Elbow Score, the MEPI and the Broberg and Morrey rating system, none of the patients presented loss of range of motion.

Statistical analysis

There were no statistical significant differences in elbow function, according to the MEPI and B&M, between the operated side and the contralateral side (Table 1).

We observed a mean postoperative Quick-DASH score of 14.36 (median 4.5). This is relative because in general population, a mean Quick-DASH score of 16 (median 9) in the applicable age group is considered to be a normal elbow [1]. We performed a one-sample Wilcoxon signed-rank test to investigate whether our median value was significantly different from the normative median, which was not the case ($p = 0.58$). We conclude that the observed statistical difference in Quick-DASH score is not clinically significant.

For both the LES and the sHSS, mean differences observed between both sides were small (respectively, 0.7 and 7.3) and did not exceed the described minimal clinically important difference of, respectively, 1.6 and 12 [24, 25].

To confirm we could accurately compare our study population to the general population, we categorized our results in commonly used clinical groups [3, 18] and noticed no difference in distribution of patients across these categories. We could not find any significant difference between the operated elbow and the contralateral side for the isokinetic strength measurements of flexion and supination at 60 and 180 Nm/s (Table 2).

Discussion

In this study, we evaluated surgical treatment outcomes of recalcitrant distal biceps tendinopathy. Our study showed good functional outcome, overall high patient satisfaction and recovery of flexion and supination strength, confirming our hypothesis. Based on five clinical scores, there was no statistical significant difference between the affected and non-affected sides in two (MEPI, B&M), and the statistical significant difference was not clinically relevant in three

Table 1 Clinical outcome scores

	n	Operated side*	Non-operated side*	Mean negative ranks	Mean positive ranks	*Z*	*p* value**
Quick-DASH	20	14.36 ± 17.24	6.25 ± 19.64	8.87	10.00	− 2.68	0.01
LES	20	8.75 ± 1.14	9.45 ± 1.61	9.50	8.36	− 2.54	0.01
MEPI	20	87.25 ± 15.43	94.25 ± 15.75	10.00	5.80	− 1.50	0.14
B&M	20	92.43 ± 8.72	95.25 ± 14.48	14.00	7.08	− 1.82	0.07
sHSS	20	86.65 ± 14.05	93.95 ± 19.11	12.50	7.31	− 1.99	0.05

LES Liverpool Elbow Score, *MEPI* Mayo Elbow Performance Index, *B&M* Broberg and Morrey Score, *sHSS* Short HSS Scoring System

*(Mean ± SD) , *Wilcoxon signed-rank test

Table 2 Values for isokinetic testing in NM at 60 and 180 degrees per second

	n	Operated side*	Non-operated side*	M_{diff}	*p* value**
Flexion 60	20	47.52 ± 23.61	48.55 ± 24.31	1.03	0.63
Flexion 180	20	32.15 ± 15.34	34.74 ± 17.11	2.59	0.06
Supination 60	19	9.01 ± 4.68	10.35 ± 5.07	1.35	0.18
Supination 180	19	6.95 ± 3.42	8.69 ± 4.40	1.74	0.06

For analysis of supination strength, 1 outlier was excluded. Normal distribution was confirmed by Shapiro–Wilk test

M_{diff} = mean difference; *df* = degrees of freedom

*(Mean ± SD), **paired *t* test

others (LES, sHSS, Quick-Dash). Isokinetic testing of peak torque for supination and flexion showed no statistical difference between the operated and non-operated arms and also corresponds with repair with a fixation device, described for acute distal biceps tendon tears with good-to-excellent outcomes [21]. This is consistent with recent findings [10, 15, 22]. Six patients encountered a transient nerve paresthesia which resolved spontaneously. These results are comparable to previous studies using a single anterior incision technique for acute distal biceps rupture repair [5, 7, 16, 17].

The optimal treatment for distal biceps tendinopathy remains controversial. The logical first step seems to be conservative treatment, although there is little evidence to support this. A case series by Durr et al. [9] and a case report by Giombini [12] show successful non-operative treatment in four out of five patients. In his systematic review, Donaldson [8] advised to pursue conservative treatment, consisting of NSAID's, splints and daily activity adaptation for a period of 6 months, although no hard evidence is available. Recently, Furia et al. [11] obtained good results by using extracorporeal shock wave therapy after 3 months. In contrast, patients resistant to conservative therapy present with persistent pain and isolated loss of supination strength [6]. To compensate for this, patients tend to use their shoulder muscles, making them prone to ipsilateral shoulder pathology [19]. Furthermore, some limited case series provide excellent results with good-to-excellent functional outcome and strength after surgical repair of ruptured distal biceps tendons [4, 10, 23]. Overall, patients are very satisfied and would undergo surgery again in a similar situation. These data strengthened our conviction that the same approach could be used to treat distal biceps tendon tendinopathy.

The exact timing of a surgical intervention remains contentious. Since it is assumed that distal biceps tendinopathy eventually will lead to rupture, one might advocate for a more aggressive approach with surgical repair after 3 months of conservative treatment [8, 17].

To our knowledge, this is the largest retrospective cohort study of surgically treated distal biceps tendinopathy. We were able to retrospectively use five different clinical scores and isokinetic strength testing, with a minimum follow-up of 1 year.

Our study has some limitations: It is a retrospective study, clinical pre- and postoperative data at set time points are missing and patients were evaluated at different time intervals postoperatively.

Conclusion

This study shows that surgical debridement and reinsertion of the affected tendon might be a valid option for patients with a distal biceps tendinopathy resistant to conservative treatment. The procedure was safe and resulted in good clinical outcome in terms of function and flexion/supination strength.

Further prospective research in larger populations is needed to compare the outcome of surgical and conservative treatment.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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