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Chronic distal biceps tendon rupture: two cases, two different techniques

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Approximately, 3% of biceps tendon injuries involve the distal portion.[3] These injuries predominantly occur in males between 40 and 60 years of age. Distal biceps tendon tears most commonly result from a sudden eccentric load applied to a flexed elbow. Both conservative and surgical treatment options are available. Surgical management demonstrates better results in traumatic cases. Conservative treatment often results in a decrease in flexion strength by 25%-30% and supination strength by 25%-40%. In addition, patients frequently report persistent chronic forearm pain.[3] There is no consensus in the literature regarding the timing of chronic tears. However, tears occurring between 3 and 12 weeks postinjury are commonly classified as chronic.[4,17] Morrey categorized tears as acute if operated on within the first 3 weeks postinjury and as chronic if addressed beyond this timeframe.[12]

Chronic cases involve more complex treatment. Tendon retraction, proximal adhesion, compromised vascularity, and tendon degeneration necessitate alternative surgical techniques. These factors contribute to less predictable outcomes, increased technical challenges, and higher complication rates.[12] In chronic and retracted distal biceps tendon ruptures, autograft and allografts are often required. Various graft options, including Achilles tendon, triceps, tensor fascia lata, and hamstring, have been described.[4,8] Among these, the lacertus fibrosus (LF) is a local autogenous graft option.

The LF is a thick band of tissue adherent to the medial fascia of the flexor muscle group. The anatomy of the LF varies among individuals in terms of length and thickness.[14] An intact LF following trauma may obscure clinical findings related to distal biceps tendon injuries, potentially delaying diagnosis by masking tendon retraction.[16] In this case report, we performed and compared 2 different surgical techniques in 2 patients who presented with chronic distal biceps tendon rupture.

Case presentation

Both patients underwent the 'Hook' test preoperatively and magnetic resonance imaging was ordered to evaluate the injury radiologically.[14] Elbow range of motion (ROM) and Mayo Elbow Performance Score (MEPS) values were noted preoperatively and postoperatively. Informed surgical consent and consent for publication form was obtained from all patients preoperatively. All patients were operated under general anesthesia in the supine position after complete muscle relaxation. Upper extremity tourniquet was used for surgical procedure. Surgical draping and sterile painting procedures were performed.

Reconstruction using hamstring graft

A Z-shaped incision was made, positioned proximally on the medial aspect and distally on the radial aspect with the elbow crease. The skin and subcutaneous tissue were incised, and the lateral antebrachial cutaneous nerve (LABCN) was located. Cubital veins were carefully isolated. The proximally retracted distal biceps tendon was located through blunt dissection, and the distal end of the tendon was débrided and revitalized.

Upon observation that the tendon stump could not reach the radial tuberosity under traction, a hamstring graft was harvested as preoperatively planned. Access to the pes anserinus was achieved Gracilis and semitendinosus tendon grafts were obtained, folded in half, and affixed to the proximal biceps tendon stump and muscle body using the Pulvertaft technique. The two free graft ends were sutured together to create a single structure (Fig. 1).

Blunt dissection was performed between the brachioradialis and pronator teres muscles to expose the radial tuberosity. With the elbow extended and the forearm in hypersupination, the radial

Institutional review board was not applicable to this case report.

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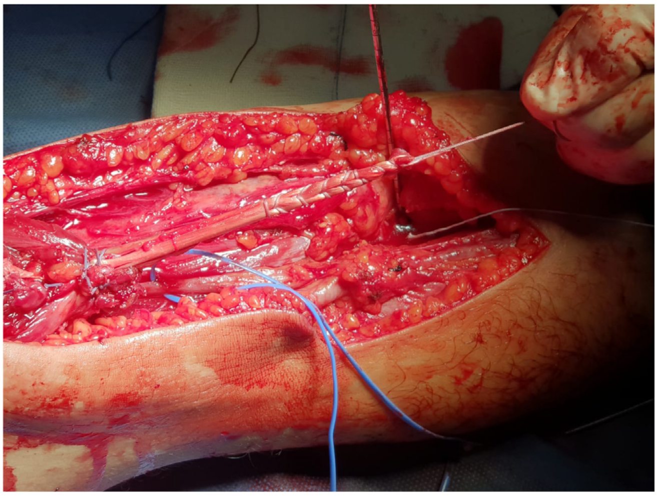

Figure 1 The two free graft ends were sutured together to create a single structure.

tuberosity was prepared. The bone surface was débrided using a curette and rongeur to remove soft tissue and create a clean bone bed. A double-cortical bone tunnel was created followed by single-cortex drilling (7-8 mm diameter) to accommodate the tendon graft thickness.

The graft tendons were secured to an Endobutton (Smith & Nephew, Andover, MA, USA) passed through the prepared bone tunnel, and tensioned appropriately. The tendon was seated within the bone tunnel and fixed using a tenodesis screw that was 1 mm smaller in diameter than the graft to ensure secure fixation. The graft was then reinforced by suturing the tendon using threads exiting from the Endobutton.

Lacertus fibrosus augmentation

Both cases were chronic. In the patient undergoing hamstring reconstruction, we proceeded with a preoperative plan involving autograft reconstruction. In the other patient, the preoperative magnetic resonance imaging did not show significant retraction, leading us to believe that primary repair would be feasible with adequate releases. However, intraoperatively, the tendon stump was extremely short, almost absent. Consequently, we decided to use the LF intraoperatively.

A Z-shaped incision was made, with the proximal limb medial and the distal limb radial aligned with the elbow crease. The LABCN adjacent to the cubital veins was carefully identified, dissected, and suspended. Blunt dissection revealed proximal retraction of the distal biceps tendon, which was found to be adherent to the LF (Fig. 2). The tendon was dissected free from the adhesion, and the LF was subsequently dissected and mobilized. The LF was augmented to the tendon stump to enhance structural support (Fig. 3).

Blunt dissection was then performed between the brachioradialis and pronator teres muscles to expose the radial tuberosity. With the elbow extended and the forearm hypersupinated, the radial tuberosity was prepared by debriding the bone surface with a curette and rongeur. Double corticle bone tunnel was created followed by drilling the adjacent single cortex (7-8 mm diameter) to accommodate the tendon graft.

Tendon sutures were loaded onto an Endobutton (Smith & Nephew, Andover, MA, USA) and passed through the prepared bone tunnel. The sutures were tensioned appropriately, and the tendon was seated within the bony tunnel and secured using a tenodesis

Figure 2 Proximal retraction of the distal biceps tendon adherent to the lacertus fibrosus.

screw that was 1 mm smaller than the tendon diameter. Finally, the tendon was reinforced with sutures exiting through the Endobutton.

Postoperative rehabilitation

Postoperatively, all patients' upper extremities were immobilized in a long-arm plaster splint with the elbow in 90° flexion and the forearm in supination. At 2 weeks postoperatively, the plaster splint was removed, and ROM exercises with gravity assistance were initiated. A shoulder arm sling was recommended for an additional 2 weeks.

From postoperative weeks 2 to 6, patients were advised to achieve an active extension limit of 30°. Full elbow extension was targeted by the second postoperative month, at which point active flexion and strengthening exercises were initiated. Patients resumed daily activities after 3 months and were cleared for sports participation at 6 months.

Postoperative functional evaluation

Postoperative ROM and MEPSs were assessed by a single physiotherapist at the final clinical follow-up.

Patient 1 (hamstring graft reconstruction):

Preoperative assessment revealed full elbow ROM and MEPS score of 85. During postoperative follow-up, scar formation was noted at the wound site. At the final evaluation, the MEPS score was 100, with a residual 10° extension deficit attributable to skin scarring.

Figure 3 Augmented lacertus fibrosus tendon stump to enhance structural support.

Patient 2 (local LF graft):

Preoperative evaluation demonstrated full elbow ROM and MEPS score of 100. At the final follow-up, the MEPS score remained 100, with no ROM limitations observed.

There were no reported complications, including transient or permanent paresthesia, in either patient. Neither graft failure nor revision surgery was required.

Discussion

There is no established consensus regarding the optimal treatment strategy for chronic distal biceps tendon tears. Data suggest that treatment outcomes for acute tears are more favorable. Kelly et al analyzed complication rates associated with distal biceps tendon repairs, revealing that the complication rate in chronic cases was 17% higher than in acute cases.[9]

In tendon graft procedures, the graft's continuation as a thin band in the antecubital fossa may compromise the ability to achieve appropriate tension and aesthetic outcomes. The avascular nature of tendon grafts limits their healing potential compared to vascularized tissues, representing a notable disadvantage when compared to primary repair.[2]

In chronic cases, various methods have been proposed to determine the role of repair vs. reconstruction. The interval between injury and surgery is a critical factor. However, it has been suggested that primary repair may still be feasible if the LF remains intact, regardless of the time elapsed since the injury.[8]

The mobility of the tendon stump is another crucial determinant. Darlis and Sotereanos recommended tendon reconstruction when the tendon stump cannot reach its radial insertion with less than 70° of elbow flexion.[4] Similarly, other studies have reported that if full supination and flexion are required to approximate the tendon stump to its insertion, reconstruction is preferred to reduce the risk of early rerupture.[4] Conversely, some researchers advocate for primary repair irrespective of the degree of flexion, provided the tendon stump is of good quality. Morrey et al demonstrated no significant difference in outcomes between patients who underwent primary repair at higher degrees of flexion vs. those repaired at flexion angles below 30°.[12]

A database analysis revealed no significant difference in revision rates between acute and chronic rerupture rates following primary repair.[19] However, in cases where the tendon stump is severely retracted or compromised, reconstruction becomes the only viable option. Both autografts and allografts are suitable choices for graft material.[1] A meta-analysis evaluating reconstruction outcomes in chronic distal biceps tendon ruptures reported a complication rate of 34% for autografts and 14% for allografts.[14] The most common complication associated with autograft use was donor site morbidity. Transient paresthesia of the LABCN was the primary complication observed with allografts. Both autografts and allografts are suitable choices for graft material.[1] No significant differences were noted between autograft and allograft groups in terms of clinical or functional outcomes.

In our case, we opted for a hamstring autograft. The literature on the use of hamstring autografts in chronic distal biceps tendon repairs is limited. Frank et al evaluated 19 cases involving semitendinosus autografts, reporting transient LABCN neuropraxia in three patients and early graft failure in 1 patient due to posttraumatic mismatch.[6] Conversely, other small series using hamstring autografts in unrepairable chronic distal biceps tendon ruptures reported no complications, revision surgeries, or graft failures at final follow-up.[7,20]

Hamer et al first described the augmentation of the distal biceps tendon with the LF.[8] This technique offers several advantages, including avoidance of donor site morbidity and elimination of risks associated with allograft use. However, the use of LF as a local graft is contingent upon its integrity.[5] LF contributes not only to tendon length but also to the formation of a more anatomically robust and cosmetically normal tendinous structure, while preserving longitudinal vascular nutrition.[2]

The LF plays a critical role in enhancing supination and flexion strength of the forearm. An intact LF following distal biceps tendon rupture has been associated with improved outcomes. Although some surgical approaches involve partial loosening of the LF to facilitate tendon manipulation during repair, this technique is not recommended, as it has been shown to decrease postoperative flexion strength.[11]

Both autograft and allograft reconstructions for chronic distal biceps tendon ruptures have been studied, with each method offering satisfactory outcomes. Phadnis et al demonstrated this in 21 patients with retracted, irreparable ruptures using Achilles tendon allografts. Significant functional improvements were observed, with QuickDASH, Oxford Elbow, and MEPSs.[15] The choice between autograft and allograft may depend on factors such as defect size, donor tissue availability, and patient-specific considerations.[17] Autografts offer strong, biologically compatible tissue for distal biceps reconstruction, reducing the risk of rejection or disease transmission. They promote better healing, are more cost-effective than allografts, and are immediately available during surgery. However, potential donor site morbidity and longer surgical time must be considered. Allografts provide good functional outcomes for distal biceps tendon reconstruction while eliminating donor site morbidity associated with autografts.[1] This is a significant advantage, as autograft harvesting can lead to complications such as additional surgical site pain and potential weakness. However, the higher cost of allografts presents a major drawback, potentially limiting accessibility for some patients.[18]

Biomechanical studies further support the efficacy of LF augmentation. Landa et al demonstrated that termino-terminal LF sutures enhanced the mechanical strength of distal biceps tendon repairs in a cadaveric study.[10] Another cadaveric study comparing local LF grafts with Achilles allografts in simulated chronic ruptures found their biomechanical properties to be comparable.[13] Clinical outcomes are also promising; in a study involving 12 patients treated with LF autografts, flexion strength was graded as 5/5 in 11 patients.[2]

Conclusion

While various treatment options and surgical techniques for managing chronic distal biceps tendon injuries are documented in the literature, no single method has demonstrated definitive superiority. In the present study, we successfully implemented and compared two distinct surgical techniques, achieving satisfactory clinical and functional outcomes in both cases. Based on these findings, the optimal approach for managing such injuries should be individualized, utilizing patient-specific data and circumstances to guide the selection of surgical techniques.

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