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Distal biceps repair using the lacertus fibrosus as a local graft

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Background: We report a case series of 15 patients who underwent a new surgical technique that uses a transfer of the lacertus fibrosus to augment the repair of the distal biceps tendon. This technique seeks to minimize the need for and potential complications associated with autogenous or allograft tendon reconstruction in this clinical scenario.

Methods: We reviewed the clinical outcomes of patients who both underwent a lacertus transfer for biceps tendon reconstruction during a 10-year period and had at least 6 months of follow-up. Their clinical outcomes, including success of tendon repair, functional performance, and associated surgical complications, were evaluated.

Results: During a 10-year period, 244 patients underwent surgery for repair or reconstruction of the distal biceps tendon. During this time, 15 patients met the criteria for use of the lacertus transfer technique. When direct repair was not possible because of tendon retraction and attrition, although a tendon graft was considered, the intact lacertus fibrosus was used to augment the biceps repair. Of these 15 patients, 12 met study inclusion criteria. At latest follow-up, all 12 patients were successfully treated by the lacertus transfer without complication, had regained elbow flexion and forearm supination strength, and had no lacertus harvest complications.

Conclusions: When operative treatment is chosen for biceps tendon injuries and if the lacertus fibrosus is intact, transfer of the lacertus to augment repair of the distal biceps provides predictable outcomes without the potential complications associated with allograft or autograft tendon reconstruction.

Level of evidence: Level IV; Case Series; Treatment Study

Keywords: Lacertus; fibrosus; transfer; distal; biceps; repair

Approximately 3% of all biceps muscle injuries involve rupture of the distal tendon[2] and are treated either surgically or by a nonoperative paradigm. However, surgical repair of the tendon is associated with a superior outcome, as untreated biceps tendon ruptures can result in a 25% to 40% decrease in supination strength and 25% to 30% decrease in elbow flexion strength. In addition, patients often experience chronic antecubital fossa pain with nonoperative care.[2,4,10]

When treated early, acute complete distal biceps tendon ruptures are typically repaired directly to their anatomic insertion site. However, when patients present late, the tendon may have already retracted and become adherent proximally. Furthermore, the tendon itself may have undergone attrition

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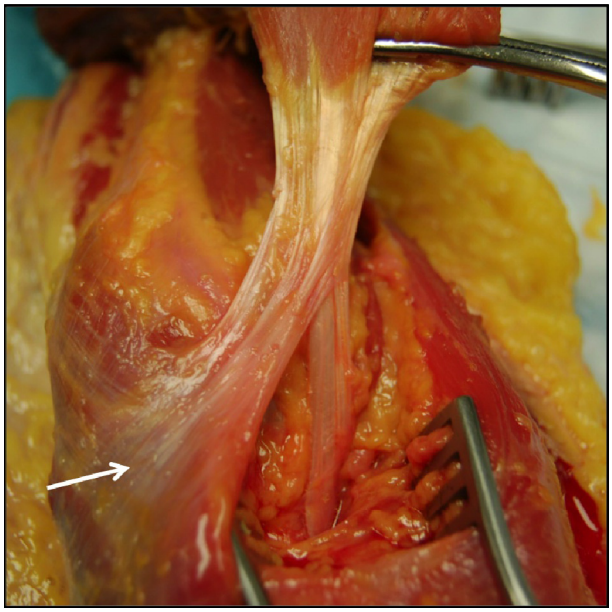

Figure 1 Anatomic dissection of intact biceps tendon (central and distal) and lacertus fibrosus extending medially to the left (*arrow*).

from chronic loss of vascularity and disease. This retraction and attrition may limit the ability of the surgeon to perform a direct repair. The surgical results in chronic cases are less predictable and technically more demanding.[7] In such circumstances, the surgeon may consider using an autogenous or allograft tendon to span the defect. Whereas reconstruction of the biceps tendon with a graft can provide a successful outcome, it does have the potential of various complications that go beyond that of direct repair alone.

We present a series of patients who underwent a new technique by which the lacertus fibrosus was transferred to the distal biceps tendon to augment the scarred biceps tendon and to create a robust distal tendon for direct repair. This technique was developed as a result of observing the robust continuity of the lacertus fibrosus in some patients who needed extensive biceps tendon mobilizations for chronic ruptures to optimize distal tendon length (Fig. 1). Instead of cutting the lacertus adjacent to the biceps muscle to optimize biceps tendon mobilization, the lacertus was left attached proximally to the biceps muscle, dissected distally, and then detached distally and medially where it became confluent with the superficial forearm fascia. The transfer of the lacertus fibrosus to the retracted biceps tendon not only increased the length of the tendon but also provided more robust and normal-appearing tendinous tissue to augment the often scarred and atrophic distal biceps tendon.

Materials and methods

During a 10-year period, 15 patients met the criteria for the lacertus transfer**.** During this same time, 244 standard direct biceps tendon repairs without lacertus transfer and 18 biceps tendon reconstructions with tendon grafts were carried out. Patients were observed at regularly scheduled postoperative intervals and evaluated for integrity of the repair, return of motion and strength, and potential complications. The criteria for using the transfer included an intact lacertus, a completely ruptured and proximally retracted biceps tendon, and an insufficient length to optimally perform a direct tendon repair to its insertion site. For each of these cases, we were prepared to perform a tendon graft if deemed necessary intraoperatively.

Surgical technique

Biceps exposure and mobilization

The procedure is performed through a single longitudinal anterior incision centrally located in the proximal forearm, which is the standard approach for the senior author for direct repairs without lacertus transfers. After localization and protection of the lateral antebrachial cutaneous nerve, the distal tendon scar is dissected to optimize length. The lacertus fibrosus is left attached to the medial side of the biceps muscle. On occasion, the biceps tendon is encased in significant scar tissue; in this instance, the tendon can sometimes be found folded back on itself inside the scar casing. A longitudinal incision in the scar casing may reveal the more normal-looking retracted tendon. The distal end of the tendon (and associated tenoma) is then grasped with a clamp, and longitudinal tension is applied during dissection to optimize the muscle-tendon length (Fig. 2, *A*). The lateral antebrachial cutaneous nerve is carefully protected on the posterior side of the biceps muscle as it crosses it medially at its proximal end and laterally at its distal aspect. Similarly, the medial antebrachial cutaneous nerve runs in the proximity of the lacertus fibrosus. For this reason, careful blunt dissection is recommended (similar to protecting the lateral antebrachial cutaneous nerve for the standard biceps repair incision alone) to avoid damaging the nerve.

In our experience, the lacertus fibrosus has not limited distal mobilization; however, this is dependent on the operative dissection technique. If one mobilizes the biceps muscle and muscle-tendon junction parallel and longitudinally from the lacertus, one would expect more mobility from the biceps tendon. However, in doing so, the lacertus would not be attached to the longitudinal fibers and thus not used as a graft. After mobilization, a direct repair is carried out if enough length is obtained. Once the tendon is localized, a tenolysis is carried out with distally oriented tension. Considering that the case is done through an anterior approach, the ability to do a primary repair is dependent on direct insertion to the biceps tuberosity without excessive flexion limiting visualization. If the mobilized tendon is of adequate length, a primary repair will be performed by tying down sutures with the biceps in 45° to 90° of flexion. Flexion >90° significantly limits safe and adequate visualization from an anterior approach. However, if the length of the healthy biceps tendon is inadequate for direct repair, a lacertus transfer is considered (Fig. 3). Obviously, the lacertus must initially be intact for this consideration. If the lacertus is not intact (eg, ruptured off the medial side of the biceps muscle) and the biceps tendon has insufficient length, a tendon graft is considered. When necessary, our current graft of choice is the Achilles allograft. The estimated range of lacertus graft length, relative to the mobilized tendon, is an additional 1 to 3 cm, with an average of 2 cm.

Lacertus transfer

The incision may need to be extended farther proximally and medially to dissect the lacertus fibrosus. We have found that this additional lengthening of the incision to release the lacertus has caused