Triceps Tendon Reconstruction Using Ipsilateral Palmaris Longus Autograft in Unrecognized Chronic Tears

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abstract

Injury to the distal triceps tendon is uncommon and can be difficult to diagnose, especially when a partial rupture or tear occurs. In situations where an incomplete disruption to the musculotendinous unit occurs, a palpable defect or clear functional loss may not be present. Advanced imaging techniques, such as magnetic resonance imaging or ultrasound, can be used to confirm the diagnosis and define the extent of injury. The treatment of a complete rupture of the distal triceps tendon is repair or reconstruction, whereas the management of a patient with a partial triceps rupture is related to the pain, functional deficit, and expectations of the patient.

This article presents 2 patients with chronic, near complete disruptions of the distal triceps tendon. In both patients, surgical reconstruction of the injured tendon was accomplished using ipsilateral palmaris longus autograft. This technique allows the treating surgeon to harvest the graft from the ipsilateral upper extremity. The palmaris autograft is then used to reconstruct the injured portion of the triceps tendon using a Pulvertaft weave technique through the intact triceps tendon and osseous tunnels within the proximal ulna. This technique allows for easy surgical setup and harvest of autograft tendon and provides a structurally sound technique for a tension-free reconstruction of the injured tendon. It also permits early postoperative elbow range of motion, with active elbow extension allowed at 6 weeks. The authors have used this technique successfully in the treatment of chronic partial tears of the distal triceps tendon.

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Injury to the distal triceps is rare. Most cases of complete rupture are treated with surgical repair or reconstruction. The diagnosis of a partial rupture is often difficult to make immediately following injury and is usually made only after the patient continues to report persistent pain and dysfunction. Advanced imaging techniques, such as magnetic resonance imaging or ultrasound, can be used to confirm the diagnosis and define the extent of the injury.

Surgical treatment of partial triceps ruptures occurs only after a trial of nonoperative management fails and the patient remains symptomatic. A sound primary repair of the tendon can be difficult when a prolonged period of time has elapsed following the initial injury. Surgical management with tendon reconstruction can provide a reliable and reproducible means of treatment for this injury.

This article presents 2 patients who sustained partial ruptures of the distal triceps and were treated with tendon reconstruction using ipsilateral palmaris longus autograft. This procedure allows for use of the patient’s own tendon in reconstruction and does not require a separate surgical procedure or setup for graft harvest.

CASE REPORTS
Patient 1
A 47-year-old healthy, left-hand-dominant man fell while in the shower and sustained a laceration to the posterior aspect of his right elbow when his upper extremity struck and broke a porcelain dish. He presented to the emergency department, where the wound was irrigated and closed. In the 2 months after the injury, the patient continued to have swelling and discomfort around the elbow. The patient was referred to the authors’ institution for evaluation. The patient’s elbow was tender to palpation along the medial aspect of the triceps insertion, where a palpable defect was noted. He reported pain near the area of the laceration, and the examination was notable for triceps weakness (4/5) with terminal extension of the elbow. He had no extensor lag and a full flexion-extension range of motion. Magnetic resonance imaging revealed a full-thickness tear of the medial portion of the triceps tendon and inflammation of the olecranon bursa (Figures 1, 2). On examination, the patient had a palpable palmaris longus tendon. A triceps tendon repair with possible reconstruction using the patient’s ipsilateral palmaris longus tendon was planned if an anatomic and tension-free primary repair was not possible.

Patient 2
A 26-year-old healthy, right-hand-dominant man injured his right elbow while diving for a volleyball. He noticed pain and swelling at his elbow. He was evaluated at another institution and diagnosed with a traumatic olecranon bursitis. The bursa was aspirated, an injection of corticosteroid was given, and a compression dressing was placed. He remained symptomatic. One month later, he presented to the same outside institution reporting increased pain and swelling in the posterior aspect of his elbow after playing tennis. His elbow was again aspirated, and a second corticosteroid injection was administered. After the second injection, the patient noticed that he was unable to play tennis or volleyball because of debilitating elbow pain and progressive weakness.

The patient presented to the authors’ institution for a second opinion 4 months after injury and 3 months after the second aspiration and injection. On evaluation, posterior elbow swelling, tenderness to palpation, and a palpable defect in the medial portion of the triceps tendon insertion were present. He had decreased (4/5) strength with resisted extension, but no extensor lag. He had a full flexion-extension range of motion. Magnetic resonance imaging revealed a full-thickness tear and retraction of the medial portion of the triceps tendon. The patient had a palmaris longus tendon. Primary repair
and possible tendon reconstruction using his ipsilateral palmaris longus tendon was discussed given the tendon retraction, the chronicity of the tear, and the concerns about tissue attenuation as a result of repeated corticosteroid injections.

**Surgical Technique**

The patients were positioned supine on an operating room table, and the affected extremity was placed on a hand table. A nonsterile tourniquet was placed on the upper brachium, and the entire extremity was prepped and draped. In the first patient, the traumatic transverse laceration was extended proximally and distally to gain exposure to the distal triceps tendon and olecranon process. In the second patient, a longitudinal posterior incision was used. The ulnar nerve was identified and protected in both patients with preservation of the intermuscular septum. The triceps tendon was exposed, and fibrous tissue and inflamed bursa were excised. Intraoperative cultures were obtained for the second patient because of his history of injections. A large defect was present in both patients, and an anatomic and tension-free primary tendon repair was unable to be performed.

The palmaris longus tendon was harvested in both patients using 3 small transverse skin incisions starting at the distal wrist crease to the myotendinous junction proximally. After tendon harvest, a nonabsorbable #2 FiberWire suture (Arthrex, Inc, Naples, Florida) was placed in a running, locking fashion on both ends. Transosseous tunnels were created in the olecranon process using 4.0- and 4.5-mm cannulated reamers in a crossing fashion for passage and subsequent tensioning of the graft. Tunnel diameter was based on the size of the prepared graft. In the first patient, one 4.0-mm and one 4.5-mm tunnel were created. In the second patient, two 4.0-mm tunnels sufficed. Proximally, the graft was passed through the native triceps tendon using a Pulvertaft weave. The graft–triceps tendon constructs were tensioned and the graft was passed through bone tunnels with the elbow at 90° of flexion. One end of each graft was passed through a tunnel, tensioned, and then sutured back to itself (Figures 3, 4). In addition, the portion of the graft woven through the triceps tendon was sutured in several places using a taper needle and a nonabsorbable suture to minimize construct creep with cyclic loading. Each elbow was taken through a full flexion–extension range of motion to ensure proper tensioning.

The tourniquet was deflated for less than 1 hour in both patients, and hemostasis was achieved prior to wound closure. Both patients were immobilized in posterior splints at approximately 90° of flexion for 7 to 14 days. Two weeks postoperatively, the patients began directed early active-assisted flexion and gravity-assisted passive extension at home. Both patients’ elbows were kept in slings, and active elbow extension was restricted for 6 weeks postoperatively.

**Discussion**

In a large series by Anzel et al, distal triceps tendon ruptures accounted for less than 1% of all tendon problems related to the upper extremity. In addition, of this small percentage, one-half of all reported injuries to the distal triceps were due to traumatic laceration of the tendon. Tendon rupture can also occur when an eccentric load is placed on the arm during elbow extension. Rupture has also been described after uncoordinated triceps contraction with elbow flexion. Multiple factors have been implicated in conjunction with these mechanical explanations, including systemic or local steroid use, chronic olecranon bursitis, systemic disease processes such as renal osteodystrophy, and congenital syndromes such as Marfan. Rupture usually occurs as an avulsion of the tendinous insertion but can occur wherever a traumatic laceration occurs or, less commonly, within the muscle belly or at the myotendinous junction.

The diagnosis of a partial or full rupture of the triceps tendon can be difficult. In some circumstances, a palpable defect is felt just proximal to the olecranon process or weakness exists with elbow extension. If the rupture is complete, extension against gravity is usually not possible, but in an incomplete rupture, some active extension may be present with associated weakness. Often, swelling or hematoma formation exists in the acute phase that may result in ulnar nerve symptoms.

A definitive diagnosis can usually be made with imaging studies. In an osseous avulsion from the olecranon process, plain lateral radiographs can be helpful in making the diagnosis. Magnetic resonance imaging allows for accurate demarcation of the location and the extent of the injury and is commonly the diagnostic imaging study of choice. Finally, ultrasound imaging has been described as a modality to...
diagnose a triceps tendon rupture because it allows for dynamic imaging and may be faster and less expensive than magnetic resonance imaging, although the quality of the ultrasound images obtained depends on the technician performing the study.13

In the majority of cases, complete distal triceps ruptures are treated with immediate surgical repair or reconstruction.14,15 Treatment of partial triceps tendon ruptures differs in that initial treatment is usually nonoperative.8,16 When the injury occurs more proximally at the musculotendinous junction, the potential exists for healing and functional improvement is usually monitored after a period of immobilization or protection. When all or a portion of the tendon is detached from the proximal ulna, little chance exists of healing, and, in the presence of persistent pain, weakness, or functional deficits, primary repair or reconstruction is considered.4

Several techniques have been described for reconstruction of the triceps tendon after complete or partial rupture. Primary repair of an acute complete rupture with nonabsorbable suture placed in a locking fashion through the avulsed tendon and brought down through drill holes in the olecranon process has been advocated when possible.4 The use of allograft or autograft tendon has been proposed when primary repair cannot be accomplished.4

Autogenous hamstring (semitendinosus) and gracilis tendon graft has been described in the literature for delayed and recurrent triceps ruptures.17,18 In a case series by van Riet et al,14 cases of distal triceps rupture were identified. Reconstruction was necessary in 9 cases, and autogenous tissue transfer was necessary in 6. Transferred tissues included Achilles, plantaris, semitendinosus, latissimus, anconaeus, and palmaris. In each case, the graft tendon was woven through the remaining distal triceps and attached through drill holes in the olecranon.14 Wagner and Cooney10 described a V-Y advancement of the triceps tendon with augmentation of the repair with plantaris autograft tendon interwoven through the repair and sutured into the medial and lateral fascia of the forearm.

In the current patients, the use of graft supplementation was required, even with a partial defect in the tendon. The use of a Pulvertaft weave through the remaining tendon and fixation through drill holes in the olecranon maximizes reconstruction strength, affords proper tensioning, and allows early postoperative motion.

**Conclusion**

In some circumstances, partial distal triceps tendon injuries can require surgical reconstruction. A delay in diagnosis or a prolonged period of nonoperative management in partial injuries can create a situation where primary repair cannot be undertaken. In these situations, the authors advocate that the ipsilateral palmaris longus tendon be used in the reconstruction. This technique allows for easy surgical setup and use of autograft tendon and a small-caliber graft that can easily be interwoven through the triceps tendon multiple times and anchored through small drill holes in the olecranon, minimizing damage to the proximal ulna. The strength of the repair also allows for early range of motion.

**References**