

Neglected Triceps Tendon Avulsion: Case Report, Literature Review, and a New Repair Method

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Abstract

Triceps tendon rupture or avulsion is a rare tendon injury. The most common feature of injury is avulsion from osseous insertion on the olecranon. The diagnosis of acute triceps tendon rupture may be missed, and a missed diagnosis can result in prolonged disability and delayed operative management. In this article, we report 2 cases of neglected triceps tendon avulsion and a new V-Y-plasty surgical technique for repair.

Triceps tendon rupture or avulsion is a rare tendon injury.¹ In a large case series, Anzel and colleagues² found that it represented less than 1% of all tendon injuries in the upper extremity. The most common feature of injury is avulsion from osseous insertion on the olecranon, and the least common features are intramuscular or myotendinous junction ruptures.³⁻⁶

The sudden eccentric load to contracted muscle, usually occurring after a fall on the outstretched hand, is the most common mechanism leading to avulsion of a small fragment from bony insertion or rupture of the muscle belly. However, ruptures have occurred after direct trauma to the posterior aspect of the arm.⁷⁻⁹ Missed diagnosis and underestimated degree of injury can result in prolonged disability and delayed operative treatment.^{7,10-12}

In this article, we report 2 cases of neglected triceps tendon avulsion and a new surgical technique of triceps tendon reconstruction with V-Y-plasty in the musculotendinous junction in which the required length of tendon is easily obtained, the V-shaped splitting of the tendon does not weaken the tendon, the blood supply is preserved because of patent continuity in the distal section, and soft-tissue damage is minimal. To our knowledge, this is the first time this surgical repair method has been described for neglected triceps tendon avulsion.

The patients provided written informed consent for print and electronic publication of these case reports.

CASE REPORTS

Case 1

A 27-year-old, right-hand-dominant engineer was admitted to our clinic with the chief concern of inability to fully extend his right elbow. Four months earlier, he had fallen down stairs with the right hand outstretched and, at another center, was diagnosed with an unspecified soft-tissue injury of the right upper extremity and treated with a long arm splint for 2 weeks, and then physical therapy. Some time after treatment, the patient realized he could not fully extend the elbow and underwent additional physical therapy, but 4 months later there was no improvement. Radiographs showed a flake of avulsed bone from the

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olecranon (Figure 1). Computed tomography (CT) was used to evaluate the olecranon and other bony lesions of the elbow region (Figure 2). Magnetic resonance imaging (MRI) was used to evaluate the extent of triceps tendon injury and the amount of tendon retraction (Figure 3). A diagnosis was made: old triceps avulsion.

Case 2

A 24-year-old, right-hand-dominant construction worker was referred to our clinic with the chief concern of

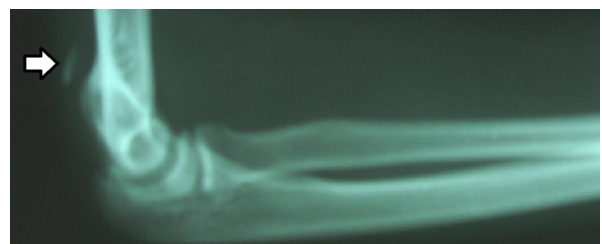


Figure 1. Lateral x-ray of elbow showing avulsed bone flake (arrow).

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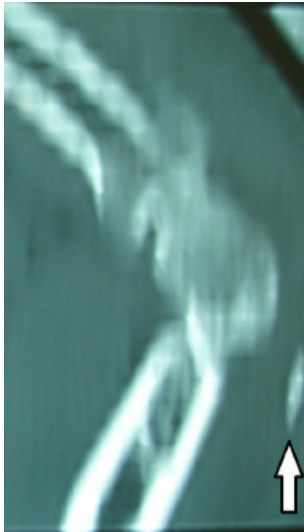


Figure 2. Sagittal CT scan of elbow showing avulsed bone flake (arrow).



Figure 3. Sagittal MRI showing triceps tendon retraction.

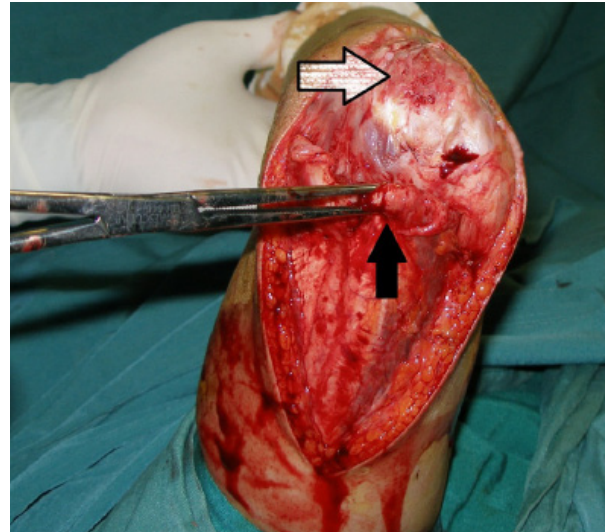


Figure 5. Avulsed triceps tendon (black arrow) could not reach its original site (dotted white arrow).



Figure 4. Defect in triceps tendon is shown in physical exam.



Figure 6. Tendon is released in an inverted V shape (dotted line) and reached its anatomical site.

weakness and inability to fully extend his left elbow. Six months earlier, he injured the left elbow in a fall with the hand outstretched, from a height of 2 meters, but did not seek treatment. On physical examination, a defect in the triceps tendon was felt (Figure 4). MRI showed a torn triceps tendon. After workup, a diagnosis of old triceps avulsion was made.

SURGICAL TECHNIQUE

In each case, the patient was given general anesthesia and was positioned in the lateral decubitus position on a universal surgical table. The upper extremity was prepared and draped from the axilla to the distal end of the limb. After a tourniquet was inflated, a 20-cm incision was made on the posterior surface of the arm, from midarm to 4 cm distal to the tip of the olecranon. The skin and fascia were opened. The triceps tendon was retracted approximately 4 to 5 cm proximal to the

olecranon. The medial and lateral retinacula were torn.

After cleaning the edges and releasing the triceps tendon from its surrounding tissues, we tried to attach the avulsed part to its origin but were not successful, as the tendon was short and contracted (Figure 5). Next we explored the triceps muscle proximally and the tendon–muscle junction proximally, medially, and laterally. A knife was used to cut an inverted V in the muscle–tendon junction at the medial and lateral head of the triceps muscle (Figure 6). The tendon was intermittently stretched, and, after each stretch, the amount of release was checked. As the amount of release was enough to attach the avulsed tendon to its origin on the olecranon in 70° of flexion, the release was stopped. The tendon was attached to its anatomical site with an anchor suture in the first case and with fiberwire suture through bone tunnels in the olecranon in the second case. Then, range of motion (ROM) was checked from 0° to 90°, and there

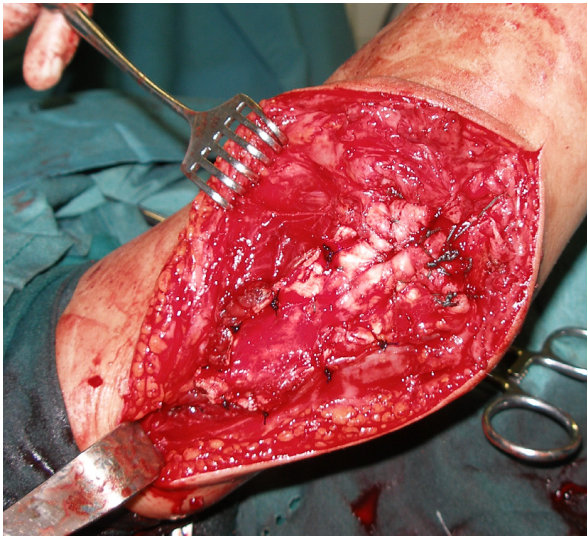


Figure 7. The tendinomuscular junction is repaired in an inverted Y figure.

was no tension on sutures. The site of tendon–muscle release was then repaired in an inverted Y (Figure 7). The wound was closed in layers and the upper extremity was put in a long arm cast in 30° of flexion.

After 3 weeks, the cast was removed, and active flexion and passive extension of the elbow from 0° to 90° was started. After 2 weeks of physical therapy, ROM was advanced gradually. After 2 years of follow-up, both patients had full elbow ROM and excellent muscle strength and were working without any problems (Figure 8).

DISCUSSION

Triceps tendon avulsion or rupture is a rare injury, the “least common of all tendon injuries.”¹³ The sudden eccentric load to contracted muscle, usually occurring after a fall on the outstretched hand, is the most common mechanism leading to avulsion of a small fragment from bony insertion or rupture of the muscle belly. However, ruptures have occurred after direct trauma to the posterior aspect of the arm.⁷

Predisposing factors, such as hyperparathyroidism secondary to chronic renal failure,^{11,14,15} hypocalcemic tetany,¹⁶ rheumatoid arthritis,¹⁷ osteogenesis imperfecta,¹⁸ anabolic steroid use,¹⁹ local steroid injection,²⁰ and insulin-dependent diabetes,²¹ can cause the triceps tendon to rupture spontaneously or with minimal or moderate force.

When suspicion is low, the diagnosis of acute triceps tendon rupture may be missed, as occurred in our 2 cases. Local swelling during the acute phase may limit physical findings, the most important being a palpable defect. After rupturing a triceps tendon, the patient cannot extend the elbow against gravity, though pain in the acute setting can prevent the clinician from conducting an accurate physical examination.²²

Triceps tendon rupture is associated with small flakes of avulsed bone visible on radiographs, but the diagno-



Figure 8. After 2 years, ROM is full with excellent muscle strength.

sis is usually missed because of low suspicion.²³ MRI and ultrasound are useful modalities in unclear cases.²⁴ MRI is also useful in preoperative planning. When MRI shows a tear of more than 50%, in addition to significant loss of triceps force, operative treatment of avulsed tendon is recommended.²⁵

Because of delayed diagnosis, the tendon is scarred and retracted. Direct reattachment of the complete avulsed tendon is impossible in most cases, but there are other options: reinforcement with autogenous tendon graft,²¹ tendon allograft,²⁶ triceps turndown flap,²⁷ and forearm fascial flap.⁸ However, we believe these methods are more difficult than our technique.

Our method is a new triceps tendon reconstruction with V-Y-plasty in the musculotendinous junction of the triceps. In this method, the required length of tendon is easily obtained, the V-shaped splitting of the tendon does not weaken the tendon—in the cases reported here, excellent muscle power was achieved—the blood supply is preserved because of patent continuity in the distal section, soft-tissue damage is minimal, and functional outcome is good. In addition, the method is simple and reproducible.

In summary, we have presented 2 cases of neglected triceps tendon avulsion and a new method of surgical management. Missed diagnosis and prolonged disability are common after triceps tendon injuries. This new reconstructive method, which can be used in the event of delayed operative intervention, is simple and efficient in achieving previous functional levels.

AUTHORS' DISCLOSURE STATEMENT

The authors report no actual or potential conflict of interest in relation to this article.

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