CASE REPORT

Distal partial ruptures of triceps brachii tendon in an athlete

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Summary Distal brachii triceps tendon rupture is rare. Partial lesions are not so well defined. If functionally they are well tolerated in patients with low functional demand, management guideline is not so clear for sportsmen. To our best knowledge, there is no reported technique for the repair of partial forms. A 28-year-old patient was operated on for a partial triceps rupture. He underwent a transosseous olecranon suture of the tricipital tendon, with a side-to-side suture to the healthy residual tendon. The patient was assessed at 2 years follow-up with the DASH score. He had painless and mobile elbow with no effusion and returned to sport 4 months after his surgical repair. The extension strength was comparable to the healthy side (5/5). The DASH score was 1.7 for global score, and 6.3 for work and sport modules. Partial rupture of brachii triceps tendon is not well tolerated in high functional demand patients. We think that patients should be operated in these situations and may achieve excellent results. Postoperative management is crucial to achieve good results as well as in complete rupture.

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Introduction

Rupture of the triceps tendon is a rare situation, with only 50 cases reported from 1987 to 2006 [1]. It is the least common of all tendon injuries [2]. It accounts for less than 1% of all tendon ruptures within the upper extremity [3,4], but development and practice of high energy and violent sports may increase triceps brachii tendon rupture incidence. Rupture of this tendon can occur at several different anatomical regions, but in general it occurs at or near the insertion of the tendon onto the olecranon. Less frequent are disruptions occurring at the intramuscular site or at the myotendinous junction. This lesion is under diagnosed on one hand, with the risk of letting evolve a partial injury towards a complete injury, which can evolve to a neglected complete form [5]. On the other hand complete ruptures generally require surgical treatment [6], but partial lesions are not so well defined.

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Partial lesions are functionally well tolerated in patients with low functional demand, but guidelines are not so clear in these situations for high-level sportsmen. To our best knowledge, there is no reported technique for partial forms repair. The authors specify their therapeutic indications in the case of partial ruptures in high functional demand patients and propose a surgical technique.

**Case report**

The authors report the case of a right-handed 28-year-old policeman practicing intensive body-building. He was lying on a weight bench and strengthened the brachii triceps when pulling a 72 kg load with the left hand. The arm was vertical at this moment. During the extension of the elbow, he felt a violent pain in the elbow forcing him to stop the exercise. After 3 rest days, in spite of pain decrease, sports practice was totally impossible, due to lack of strength in extension with residual pain. The clinical examination found a good distally triceps insertion with no gap, a forearm bruise with a triceps tendon continuity. There was no elbow laxity and no neurological lesion. A magnetic resonance imaging (MRI) confirmed the diagnosis of partial rupture (50%) of the deep portion of the distal brachii triceps tendon (Fig. 1). The posterior part of the tendon seemed continuous.

The patient underwent a surgical repair using a classical posterior approach, similar to a Gschwend posterior approach. The superficial part of the triceps tendon was intact (Fig. 2). The median opening of the posterior tendon allowed finding the retracted deep portion of the tendon, which corresponded to the medial tricipital muscle. The median tendon was reinserted through an olecranon transverse trench (Fig. 3, Video 1). The deep tendon was stitched at the superficial one by separated sutures to strengthen the reconstruction, which allows an earlier mobilization of the elbow (Video 2).

An articulated elbow cast was used postoperatively for weeks with 0–60° for range of motion. Afterwards, the flexion was increased progressively of 10° every week until the complete flexion was reached. The extension was passive during 6 weeks and the flexion was active. The cast was removed at 6 weeks post operatively. The active intensification began after 2 months.

At the last follow-up, the patient had a dry painless elbow. The mobilities were similar to the opposite side. The strength of extension compared well to the healthy side (5/5). The DASH was [3,7] points for global score, 6,3 for work and sport modules. The patient returned to full sport activity (body-building) at 4 months postoperatively and considered the result as excellent and would agree to redo the intervention if one needed.
Discussion

Several common mechanisms can explain triceps rupture. The most common mechanism of injury occurs when there is an active contraction of the triceps muscle in extension with a forced passive flexion, as when the patient falls onto an outstretched hand \([8,9]\). Other reported cases have included motor vehicle accidents \([10]\), seizures \([11]\), volleyball serving \([12]\), punching \([12]\), hammering \([13]\) and weight lifting \([14–17]\).

In healthy adults, a substantial force is usually required for the triceps tendon to partial or total rupture, whose diagnosis can be quickly made. However, the structural integrity of the tendon can be altered by several conditions which include chronic renal failure, rheumatoid arthritis, systemic lupus erythematosus, hyperparathyroidism, hemangioendothelioma, Marfan syndrome, osteogenesis imperfecta tarda and olecranon bursitis \([7,10,18–20]\). Additionally, quinolone treatment \([21]\), local corticosteroid injections \([22,23]\) and anabolic steroids \([24,25]\) have been implicated in tendon ruptures. Specific factors identified in triceps tendon rupture, are the treatment of olecranon bursitis with local corticosteroid injections \([18]\), as well as the use of anabolic steroids in weight lifters \([26]\). Corticosteroids placed directly into a tendon are thought to cause collagen necrosis and significant tendon weakening \([27]\). In terms of anabolic steroid use and tendon ruptures, case studies have proposed a link \([1]\) and experimental studies in animals have shown that anabolic steroids in combination with intense exercise can lead to changes in tendons \([28–30]\).

Patients typically present following an acute injury, complaining of sudden pain. On examination severe swelling, pain and ecchymosis are seen in the elbow. Additional indications of rupture are a palpable gap in the triceps tendon insertion and weakness in elbow extension demonstrated by the inability to extend the forearm against resistance. A thorough neurological examination should also be conducted, as ulnar palsy or tunnel syndrome may complicate triceps tendon ruptures \([15,31]\). However, the diagnosis of acute triceps tendon rupture often proves to be difficult, and is frequently undiagnosed \([32,33]\). The partial ruptures can easily be ignored because pain quickly disappears after the traumatic and clinical presentation can be misleading. Madsen \([34]\) believed that the medial part of the triceps tendon had a distinct insertion, deeper than the central tendon, and it is thus the entire medial tendon that retracts when the partial tear is deep (Fig. 4). Radiography can reveal signs indicative of triceps tendon rupture. These signs include avulsed bone from the olecranon \([10,35]\) in acute lesion. MRI is of great value in the diagnosis and localization of the tear, as well as in assessing the extent of the tear \([36,37]\). The classic sign of rupture shown on MRI is a fluid filled gap where the triceps tendon is devoid and retracted. The extent of the tear can help decide whether surgical repair is necessary in acute situation.

Early surgical repair is recommended for complete rupture of the triceps tendon, but surgical repair of a partial rupture is controversial \([38]\) because it is usually well tolerated in the sedentary patients with low functional demand. In cases where there is solely partial rupture of the triceps tendon, conservative treatment is regularly preferred.

**Figure 4** Anatomical illustration of the triceps insertion. The deep anterior tendon is torn and retracted and represents the medial muscular part of the triceps. The superficial posterior tendon is continuous and represents the lateral and the long part of brachii triceps.

Sierra \([1]\) proposed nonoperative treatment for all partial rupture, but he does not take into account the functional demand of the sports patients. This is achieved with splint protection at 30° flexion for a period of approximately 6 weeks \([10]\). When the triceps rupture is associated with fracture of the radial head, or rupture of the medial collateral ligament, surgery is implicated \([39]\). The potentially pejorative evolution of these partial ruptures has to remind that a complete rupture can occur. Surgical repair is recommended for ruptures involving greater than 50% of the tendon, as shown on MRI \([40]\). Authors think that young patients and high-level sportsmen need surgical procedure even for partial lesions to avoid the evolution to complete rupture and functional degradation. It is necessary to avoid chronic retracted lesions which require more demanding treatments. We think that the partial tear in young, sports, active patient or which have an important functional demand must be surgically repaired. Surgical repair is implicated in cases involving complete rupture of the triceps tendon at the tendinous insertion to prevent late functional disability \([9,41,42]\). The most common form of repair reattaches the tendon through drill holes in the olecranon \([10]\). Other techniques include reattachment to an olecranon perosteal flap, or to intrasosseous anchor. We think that the best way to obtain a solid insertion with the minimal risk of iterative rupture is to repair tendon insertion with a transosseous reinsertion. This surgical technique need to make a transversal olecranon trench, and reinsert tendon with a double U knots technique which are able to get a solid primary reinsertion, and allows an earlier mobilization of the elbow. We do not recommend using anchors to permit postoperative MRI evaluation.
Conclusion

In summary, rupture of the triceps tendon is the least common of all tendon injuries. It occurs most commonly following an active contraction of the triceps in extension with a forced passive flexion. Factors such as the use of anabolic steroids or the local injection of corticosteroids can increase the risk of this injury following minor trauma. Clinical examination and MRI are important in the diagnosis and preoperative assessment to detect the partial forms and avoid the passage in the chronic forms. Treatment depends on the extent of the rupture, level of activity and age of the patient. Surgical repair of partial ruptures however, remains controversial, because of good results of conservative treatment is often simple and effective in these cases. However, the authors recommend surgical repair in strength workers or sportmen and in young people. The technique of reintegretion requires an osseous trench in the olecranon, and a suture by an inverted double U suture.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

Appendix A. Supplementary data


References


