

## C A S E R E P O R T

# Open patellar tendon avulsion from tibial tuberosity after ACL reconstruction successfully treated with suture anchors

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**Summary.** Patellar tendon rupture after anterior cruciate ligament (ACL) reconstruction is a rare complication which usually occurs in the early postoperative period during rehabilitation. The management of open avulsions from tibial tuberosity has not been clearly defined yet. We describe a previously unreported case of traumatic and open patellar tendon avulsion from tibial tuberosity one year following ACL reconstruction in an elite football player which was successfully treated with suture anchors. ([www.actabiomedica.it](http://www.actabiomedica.it))

**Key words:** patellar tendon, rupture, repair, anterior cruciate ligament reconstruction, postoperative complications

## Introduction

Patellar tendon rupture after anterior cruciate ligament (ACL) reconstruction is a rare complication (0.06-0.24%) which usually occurs in the early postoperative period during rehabilitation programs (0-6 weeks) (1, 2). However, delayed injuries up to 10 years have been reported (3). Although ruptures of native, unharvested tendons are commonly in the proximal aspect, tears after ACL graft harvest occur both in a proximal or a distal pattern (2). We describe a case of traumatic and open patellar tendon avulsion from tibial tuberosity one year following ACL reconstruction in an elite football player. To our knowledge, this is the first report of an open tibial avulsion of the patellar tendon which was successfully treated with suture anchors.

## Case report

A 23-year-old male elite football-player (180 cm x 80 kg, BMI 24.69) suffered an isolated tear of the right ACL in December 2010 as a result of a sports

accident. The ACL was reconstructed using a bone-patellar tendon-bone ligament repair. Surgery and postoperative rehabilitation were uneventful, and the patient returned to elite football competitions after 8 months.

In November 2011, the patient was involved in a street accident (car against motorbike); he was catapulted falling onto both knees, and dragged on the street. On physical examination in the emergency room the patient had significant right knee effusion with a 10 cm long and deep wound below the patella. Standard radiographs revealed patella alta (Figure 1). Urgent CT scan excluded tibial plateau fractures, but avulsion of the patellar tendon from the tibial tuberosity was identified (Figure 2). The patient underwent immediate surgical repair. Examination under anesthesia of the knee revealed no varus or valgus instability, but Lachman test was positive. Accurate debridement and lavages were performed.

The tendon was found to have avulsed from the tibial tuberosity (Figure 3), and the proximal aspect of the tendon appeared attenuated and degenerative in nature; moreover, no fibers remained connected to the tibial tuberosity. To re-fix the tendon to the native

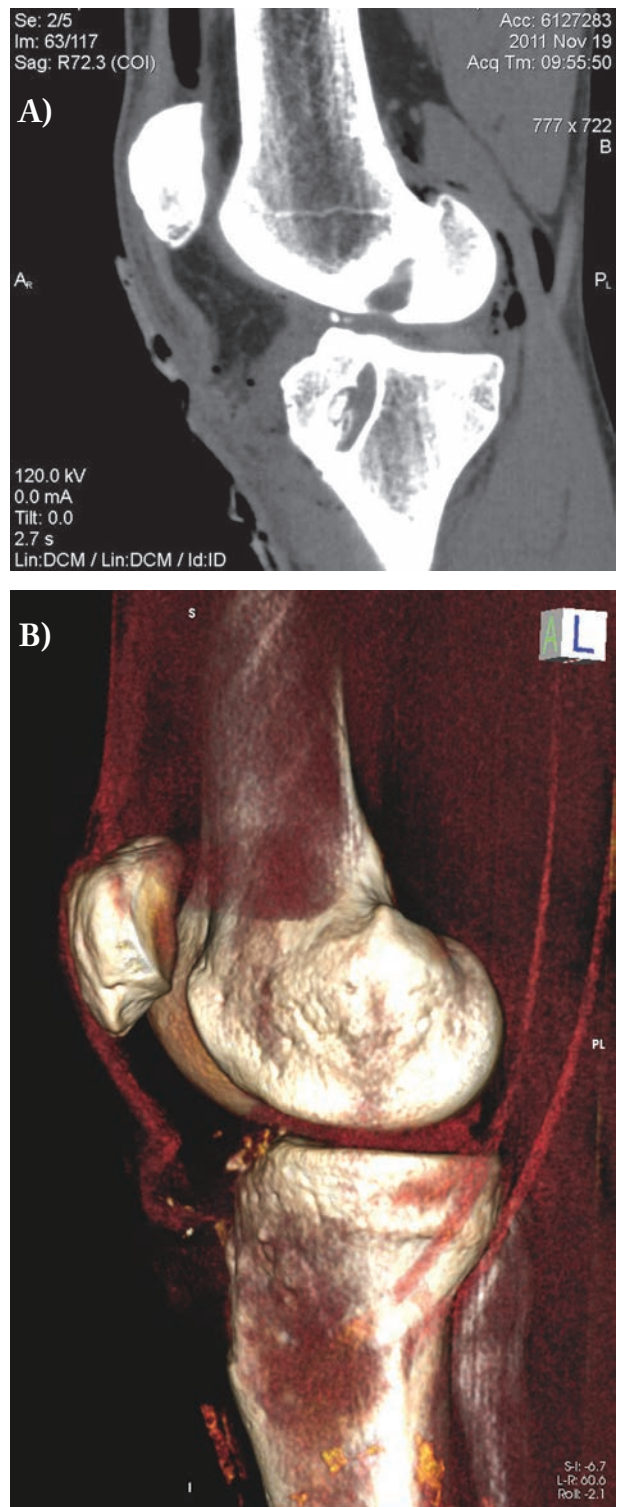


**Figure 1.** Post-traumatic standard x-ray showing patella alta

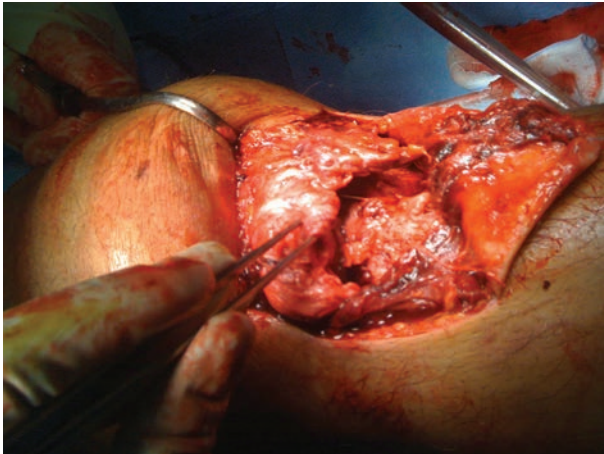
place, trans-osseous sutures were excluded because of the risk of an excessive bone defect and weakness due to presence of multiple holes close to the tibial tunnel of the ACL reconstruction.

We established to fix the tendon using three suture anchors (“Super Quick Anchor Plus” DePuy Orthopaedics, Warsaw, IN, USA, and “LINVATEC Super Revo” CONMED Corporation, Largo, FL, USA). Stability was manually tested through forceful pulling on the anchor to ensure that pullout could not occur. Reconstruction was reinforced with multiple wire loops because of the risk of further damage (Figure 4). The treatment of ACL tear was delayed to prevent joint stiffness and the risk of infection.

Immediate postoperative x-ray showed normal patella position (Figure 5). Knee brace in full extension was used for four weeks, followed by a gradual increase of the joint range of motion. In January 2012, ten weeks after injury, the patient returned to full-time work and continued rehabilitation programs. In May 2012, 6-month follow-up showed complete range of motion of the knee joint with no pain, and CT scan revealed appropriate tendon reconstruction (Figure 6).



**Figure 2.** Urgent CT-scan, sagittal image [A] and 3D reconstruction [B], demonstrating patellar tendon avulsion from the tibial tuberosity



**Figure 3.** Preoperative evaluation revealing complete distal avulsion of the patellar tendon from the tibial tuberosity

In August 2012 the patient underwent further ACL reconstruction in another hospital with contralateral hamstring graft with good functional recovery. Return to football competitions was allowed eight months later, in April 2013.

## Discussion

Ruptures of the patellar tendon are uncommon after ACL graft harvest (0.06-0.24%) (1, 2), as biomechanical analysis concludes that the remaining two thirds of the patellar tendon should be more than sufficient to resist rupture during quadriceps contraction under considerable loads (4). Moreover, the remaining tendon undergoes an ongoing histologic process of maturation that includes thickening and increased collagen fibril size, as well as hypercellular deposition (5). Although they are early postoperative complications, delayed injuries up to 10 years have been described (3), and usually occur in either a proximal-medial and distal-lateral pattern or an entirely distal pattern (6).

Whilst nonoperative management of a partial tear may be advocated, resulting in a rapid functional recovery (6), complete tendon lesions require surgical repair.

Lee et al. reviewed data related to 1725 consecutive patients who underwent primary ACL reconstruction using bone-patellar tendon-bone autograft and found only 1 case of patellar tendon rupture (1).



**Figure 4.** Intraoperative views showing initial [A] and final [B] re-fixation of the avulsed tendon with suture anchors

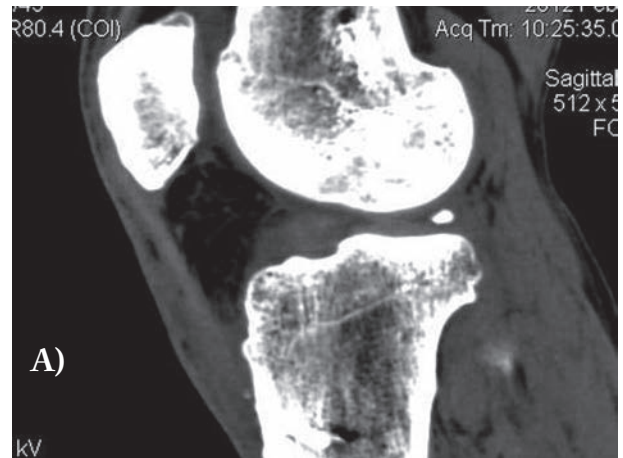
The patient, a 42-year-old police officer, slipped on ice 4 weeks postoperatively suffering a hyperflexion injury, and sustained a distal rupture of the infrapatellar tendon. The surgical procedure involved repair with a double layer Bunnell suturing of the tendon ends, reinforced with double-bundle hamstring autograft, as well as figure-of-eight tension band technique using an 18-gauge wire. Four months later removal of



**Figure 5.** In the immediate postoperative check, restoration of proper patella level and correct positioning of titanium suture anchors are evident

the hardware was required. In a large series of 5364 ACL reconstructions published in 2012, Benner et al. reported 13 patellar tendon ruptures up to 56 days after surgery, for an incidence of 0.24% (2). Tear pattern differed from the usual proximal-only tear which is most commonly observed in unharvested tendons. Seven of 13 ruptures occurred from the patella origin medially and the tibial insertion laterally. Surgical repair was performed using suture anchors which were placed in the patella and/or the tibia depending on the site of lesion. A Dall-Miles cable was finally passed through both patella and tibia with no soft tissue augmentation. Immediate postoperative mobilization was started, and an immobilizer was required during ambulation only, maintaining a full weightbearing status. The Dall-Miles cable was removed 2 to 3 months after tendon repair when limiting the flexion.

Ouweleen and McElroy previously documented the Z-type tear pattern (7), and 2 additional cases of complete distal tendon ruptures were reported (4, 8).



**Figure 6.** Six-month CT-scan, sagittal image [A] and 3D reconstruction [B], demonstrating appropriate tendon repair

As the Z-type tear pattern leaves 2 bony attachment sites, it can be successfully treated without soft tissue augmentation. Conversely, complete detachment from the tibia is normally managed by using transosseous tunnels. Successful repair using a bone-tendon-bone (BTB) allograft followed by a multiple-wire loop reinforcement with no postoperative immobilization was described in a professional handball player by Milankov Ziva et al. (9). A simultaneous reconstruction of both ACL and avulsed patellar tendon has also been reported, and reattachment of the anterior tibial tubercle using a cerclage wiring technique was performed satisfactorily (10).

In comparison with previously published cases, our patient presents several peculiarities. First, the mechanism of injury, as the rupture occurred following a fall during a street accident. Second, the associated recurrence of ACL rupture. Third, the large opening of the lesion, which required an urgent treatment. Finally, the innovative surgical solution.

Due to the high risk of infection related to the open injury, repair of the concomitant lesion of the reconstructed ACL was delayed. However, when completed emergency checks, an urgent surgical treatment of the avulsion of the patellar tendon was carried out.

Many surgical techniques for acute restoration of patellar tendon disruptions have been described. Repairs of the tendon to bone may be augmented with a Dall-Miles cable, Dacron sutures, neutralization and cerclage wires, autogenous semitendinosus graft, and BTB allograft (11).

Trans-osseous re-fixation of the tendon to the tuberosity was primarily excluded because of the possible bone weakness induced by multiple holes close to the tibial tunnel of the ACL neoligament.

Suture anchor fixation in patellar tendon avulsion is an excellent technique that enables strong anchorage with minimal dissection and eliminates possible complications associated with alternative procedures (12). Finally, effective healing and relatively fast return to functional activities are to be expected compared with the intra-osseous suture technique (13).

Use of the titanium anchors has several advantages: excessive shortening is prevented because the tendon edges do not penetrate into the bone tunnels, and loosening or expansion is not an issue. Furthermore,

the periosteal dissection is less aggressive as complete exposition of the tibia is not required. Therefore, this technique prevents the need for additional surgery, although the removal of hardwares can be considered a minor procedure.

Finally, the use of suture anchors proved out to be an effective technique for the treatment of patellar tendon rupture from tibial tuberosity following ACL reconstruction.

In conclusion, patellar tendon rupture is a rare complication following anterior cruciate ligament reconstruction. Surgical repair of traumatic and open patellar tendon avulsion from tibial tuberosity following ACL reconstruction in an elite football player can be successfully treated with suture anchors, allowing early rehabilitation and complete sports recovery.

**Conflict of interest:** Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article

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