CASE REPORT

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Neglected patellar tendon rupture with anterior cruciate ligament rupture and medial collateral ligament partial rupture

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Anterior cruciate ligament injuries are common, mostly occurring during sports trauma. Conversely, patellar tendon ruptures are uncommon injuries secondary to forceful contractions of the extensor mechanism. It is important to consider the possibility of combined injuries around the knee. We present a case of neglected patellar tendon rupture with anterior cruciate ligament and medial collateral ligament rupture treated with arthroscopic anterior cruciate ligament reconstruction combined with patellar tendon reconstruction.

Key words: Anterior cruciate ligament; arthroscopy; knee; patellar tendon; reconstruction; rupture.

Anterior cruciate ligament (ACL) injuries are common and occur mostly during sports trauma.[1] Various injury mechanisms have been described as the cause of ACL injuries. The most common mechanisms are the pivoting and cutting maneuvers performed in sports.[2] Conversely, patellar tendon ruptures are rare injuries,[3,4] and occur secondary to forceful contractions of the extensor mechanism.[1]

The combined injury of the ACL, the patellar tendon and the medial collateral ligament (MCL) is very unusual, and has been limited in the literature to case reports.[5-7] In addition, because of its rare occurrence, a definite treatment protocol has not yet been established.[1,7]

We present a patient with neglected patellar tendon rupture, ACL rupture and MCL partial rupture, treated with arthroscopic ACL reconstruction combined with patellar tendon reconstruction.

Case report

A 30-year-old male injured his knee while playing football. The patient reported the trauma mechanism to be a deceleration with the foot fixed on the ground and knee flexed. Upon referral to our hospital 16 weeks after the injury, the patient was wearing an immobilizer on his knee. He had Grade 2 joint effusion and could not extend the knee. The patella was superiorly displaced, and there was a significant gap at the center of the patellar tendon. Lachman and pivot shift tests were positive. Subsequently, radiographs showed the superior displacement of the patella. Magnetic resonance imaging (MRI) confirmed complete patellar tendon rupture combined with complete ACL and partial MCL ruptures (Fig. 1).

Anterolateral and anteromedial portals were used for diagnostic arthroscopy. Complete ACL midsubstance rupture and mild synovitis were confirmed, but there was no meniscal injury. Hamstring tendons (gracilis

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Fig. 1. **(a)** Sagittal and **(b)** coronal MRI scan of the patient after the injury. [Color figure can be viewed in the online issue, which is available at www.aott.org.tr]

and semitendinosus) were harvested from the uninjured knee of the patient. Remnants of the ACL were excised, synovectomy was performed, and tibial and femoral tunnels were reamed over the ACL guide pins. Arthroscopy-assisted ACL reconstruction was performed using 8 mm, quadruple strand semitendinosus and gracilis tendon autograft. Femoral fixation was achieved using a 25 mm ToggleLoc™ (Biomet, Warsaw, IN, USA) fixation device. The graft was fixed distally to the tibia using a 10-25 mm bioabsorbable interference screw and a cortical staple.

Attention was given to the ruptured patellar tendon. The knee was exposed through a midline longitudinal incision. There was a complete rupture in the mid-substance of the patellar tendon with massive fraying of both ends. The retinaculum was torn medially and laterally (Fig. 2a). Following debridement of the fibrotic tissues on both sides of the injured tendon, the defect approximately 2 cm in length was spotted. Flexing the knee up to 60 degrees, each side of the torn patellar tendon was approximated using the Krackow technique with no.2 fiber-wires (Arthrex Inc., Naples, FL, USA). In order to encourage repair and reconstruction of the patellar tendon length, gracilis and semitendinosus autografts were augmented as figure-8. A single tunnel at the tuberosity of the tibia and double tunnels at the distal pole of the patella, all parallel to each other, were drilled for this augmentation. At first, the semitendinosus tendon was passed through the tibial tunnel, then through the patella from the medial to the lateral side. The gracilis tendon was first passed through the patella from the lateral to the medial side, then the knee was flexed up to 60 degrees and the two tendons were sutured to each other at their insertion. Additionally, the gracilis and semitendinosus tendons were sutured to the patellar tendon at the defect area with multiple sutures (Fig. 2b). The

Fig. 2. Patellar tendon reconstruction. **(a)** Patellar tendon defect after debridement. **(b)** Reconstruction by using hamstrings. **(c)** Reinforcement with a cable. [Color figure can be viewed in the online issue, which is available at www.aott.org.tr]

Fig. 3. Sagittal MRI scan of the patient at the 12th month follow-up. [Color figure can be viewed in the online issue, which is available at www.aott.org.tr]

torn retinaculum was repaired using no.2/0 absorbable sutures. Finally, stability of the reconstruction was enhanced with a cable that was applied between the patella and tuberosity of the tibia at 60 degrees of knee flexion (Fig. 2c). After the reconstruction of the ACL and patellar tendon, varus-valgus instability of the knee was investigated. We detected medial collateral ligament injury as Grade 1, and decided to treat the MCL injury conservatively.

The knee was initially put in a hinged brace, locked in full extension for ambulation. Full weight-bearing was not allowed during the first postoperative month. Early rehabilitation was begun the day after the operation. Straight leg raising, active terminal knee extension and isometric quadriceps contraction exercises were encouraged under the control of a physiotherapist.

The patient achieved 110 degrees of flexion at 3 months. He had no extension gap, and pivot shift and Lachman tests were negative. No instability was observed in varus-valgus stress tests. The patient's International Knee Documentation Committee (IKDC) score was 88/100. The cable was extracted at the 6th postoperative month. At the 12th month follow-up, the patient had 0° to 130° of motion in the left knee as well as a negative Lachman test. Quadriceps strength against resistance was comparable to the opposite side. He was permitted to return to sports activities as tolerated. MRI scans showed anatomic ACL and patellar tendon reconstructions with a healed MCL sprain at the 12th postoperative month (Fig. 3). The knee flexor strength was measured manually, with the patient in a sitting position. The knee was flexed to 70 degrees with a goniometer, and the patient was encouraged to flex his knee against the resistance of the physician's hand. Knee flexor strength of both knees were similar at 70 degrees of knee flexion at the final follow-up.

Discussion

Anterior cruciate ligament ruptures are relatively common sports injuries.[1] Conversely, rupture of the patellar tendon is rare.[3,4] It typically occurs in males under 40 years of age and is most common in young adults with well-developed quadriceps muscles and closed tibial epiphyses.[5,8] The incidence of rupture of the ACL in combination with the patellar tendon is even rarer.[5-7] Because of the diagnostic difficulties during the initial evaluation of the injured knee, the patellar tendon

Fig. 4. Insall-Salvati ratios. **(a)** Right uninjured knee. **(b)** Left injured knee preoperatively. **(c)** Left knee at the 12th month follow-up.

rupture is often misdiagnosed. When the literature on PubMed was reviewed, a few case reports similar to our case that were initially misdiagnosed were identified.[1,7,8] In 1991, Rae and Davies reported a case describing the same injury combination in which the patellar tendon rupture was not initially diagnosed.[5]

The preferred treatment method of the initial patellar tendon rupture is primary end-to-end repair combined with reinforcement by cerclage or cast immobilization of the knee in extension for 4 to 6 weeks.[4,9] Delayed operative treatment can cause quadriceps atrophy and limitation of flexion. Due to the inability to primarily repair the patellar tendon end-to-end, a gap occurred after the debridement of both torn sides of the injured tendon. Therefore, we had to use gracilis and semitendinosus tendons for reconstruction and a cable for reinforcement rather than a cerclage wire in order to prevent the possible early failure of the cerclage wire. There was no presentation of such a treatment in a similar case in the reviewed literature.

Functional results are often better when the Insall-Salvati ratio of the injured knee is re-approximated to that of the contralateral knee.[10] Patellar height was also re-approximated to that of contralateral knee in our case (Fig. 4). The preoperative Insall-Salvati ratios of our patient's injured and uninjured knees were 0.65 and 0.83, respectively. At the 4th month follow-up, the Insall-Salvati ratio was 0.84 for the injured knee. Restoration of the patellar tendon length optimizes knee extensor function and may diminish later patellofemoral symptoms.[4,11] Reconstruction that is favored by many authors is the current option for ACL rupture.[12]

The most common mechanism of injury is a forceful quadriceps contraction against a fixed load of the full body weight, placing the knee in a flexed position.[1] The injury mechanism in our case was the same as others reported in the literature. All patients in previous reports were relatively young, and so was our patient.[1] Examination of the knee just after the acute injury is difficult, and the lack of full active extension of the knee can be incorrectly attributed to hemarthrosis of the knee or pain, so that patellar tendon rupture may be missed. Definitive diagnosis can be easily missed without having a high incidence of suspicion. Radiological investigation is very important in confirming the pathology. True lateral radiograms of the knee can give a clue to the presence patellar tendon rupture. When there is a suspicion, MRI should be performed. MRI has good resolution on soft tissues and ligamentous structures.

The goal of treatment is to restore the extensor mechanism and knee stability. Reconstruction of ACL with gracilis and semitendinosus autografts has been shown to be effective in cadaveric studies and is favored by many authors.[12] Some authors advise the repair of the patellar tendon first, and to delay ACL reconstruction due to the higher risk of developing motion problems.[13] However, others prefer to operate at the same time in order to avoid a second operation and to accelerate the rehabilitation program.[1,14,15] A consensus of ACL reconstruction and nonsurgical treatment of the MCL injury is accepted for complete ACL tears associated with Grade 1 and 2 MCL injuries.[16] The valgus stability of the knee can be assessed to determine whether the MCL injury needs to be surgically addressed.[17] Medial collateral ligament repair or reconstruction may be required for persistent, subjective, functional, or clinical valgus laxity that compromises athletic ability.[16]

The primary function of the hamstring muscles is to flex the knee. The majority of studies have shown the satisfactory recovery of isokinetic knee flexor strength after ACL reconstruction using hamstring tendons.[18,19] Eriksson et al.[20] and Hioki et al.[21] compared strength in patients with regenerated and non-regenerated tendons and found no difference in the peak torque strength during isokinetic knee flexion.

In conclusion, patellar tendon rupture with accompanying ACL rupture is a rare condition that may be easily misdiagnosed. Prompt diagnosis, immediate treatment and controlled rehabilitation are keys to successful management of this condition.

Conflicts of Interest: No conflicts declared.

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