Abstract
The simultaneous diagnosis of ipsilateral patellar tendon rupture and anterior cruciate ligament tear is rare. Surgical repair is complicated by different rehabilitation regimens as well as anterior cruciate ligament graft choices. We present a case where at the same operative setting, the patellar tendon was repaired, and the anterior cruciate ligament reconstructed with autologous hamstring graft.

A n isolated tear of the anterior cruciate ligament (ACL) is a relatively common injury, while rupture of the patellar tendon is less frequently seen. Rupture of both on the ipsilateral side is a relatively rare occurrence, limited to only case reports in the literature.\textsuperscript{1,2} We present the case of a patient with rupture of both the ACL and patellar tendon, his predisposing conditions, and subsequent management.

Case Report
A 30-year-old athletically active male presented complaining of pain, swelling, and inability to bear weight on the left knee after twisting it landing from a jump while playing basketball. He was seen two days later by the senior author, who aspirated approximately 70 cc of grossly sanguinous blood from the left knee. Physical examination demonstrated a palpable defect in the patellar tendon at the inferior pole of patella, as well as patella alta, consistent with a complete rupture of the proximal patellar tendon. Loss of the extensor mechanism of the knee was confirmed by inability to perform a straight leg raise on the affected side. The patient also had a positive anterior drawer and Lachman test without a firm endpoint. A magnetic resonance image of the left knee confirmed concomitant tears of the ACL and patellar tendon. Four years prior, the patient had undergone an arthroscopic partial lateral meniscectomy in the same knee. The patient’s postoperative course was complicated, at that time, by mild inferior pole patellar tendonitis that resolved three weeks postoperatively.

Surgical reconstruction of the patient’s ACL and repair of his patellar tendon was performed the day after presentation. Arthroscopic evaluation revealed a complete rupture of the midsubstance of the ACL. A complex tear of the posterior horn of the lateral meniscus was noted to extend posteriorly to the popliteal fossa. Radial and flap components involving approximately 70\% of the width of the posterior horn were resected. The residual posterior horn had a peripheral tear close to the menisco-synovial junction which displaced easily into the tibiofemoral joint. This tear was stabilized with three 10-mm meniscal arrows (Bionix, Malvern, PA). An arthroscopic-assisted endoscopic ACL reconstruction was performed using quadruple strand semitendinosis and gracilis tendon autograft. Femoral fixation was via the Linx device (Mitek, Norwood, MA). The graft was fixed distally to the tibia using a bioabsorbable interference screw and cortical staple.

Attention was then given to the ruptured patellar tendon. A complete rupture in the mid-substance of the patellar tendon was present, with massive fraying of both ends of the patellar tendon. The retinaculum was intact both medially and laterally. Krackow stitches were placed on both the medial and lateral aspects of the distal and proximal
stumps of the patellar tendon with both #5 and #2 braided nonabsorbable sutures, respectively. Suture drill pins were used to create three parallel drill holes from the tip of the patellar tendon to the proximal pole of the patella. These holes were spaced approximately 8 mm apart. Sutures were passed through the patella via the pins. The sutures were then appropriately tensioned and tied. The proximal stump sutures were then placed into the insertion of the patellar tendon on the tibial tuberosity and tied under tension, creating an anterior/posterior overlapping of the proximal and distal stumps, respectively. The two stumps were then tied to each other using horizontal mattress sutures from anterior to posterior using #1 absorbable mattress sutures. Range of motion was performed from 0° to 45° with no disruption of the repair.

The patient was immobilized in a brace in full extension immediately postoperatively and wore the brace for four weeks. At that time, he was started on gentle passive range of motion of the left knee and quadriceps sets, and was allowed to partially bear weight as tolerated on his left leg using his brace in full extension. He was advanced to full weight bearing at 8 weeks.

At 6 months postoperatively, the range of motion of the left knee was 0° to 115°. Further examination demonstrated a firm endpoint on the Lachman and anterior drawer tests. The patient was permitted to return to non-impact sports and given an ACL brace for use while playing golf. At a follow-up examination 9 months postoperatively, patellofemoral crepitus as well as symptomatic prominent suture material over the proximal patella were noted. He underwent operative arthroscopy of the left knee with debridement of scar tissue and resection of the prominent suture material. Range of motion of the knee at this time was 0° to 120°. At the one-year 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 using a functional knee brace. Three years after his operation, he successfully completed The Ironman Triathlon competition in Hawaii.

**Discussion**

Anterior cruciate ligament tears are relatively common injuries, occurring approximately 80,000 times a year in the United States. On the other hand, rupture of the patellar tendon is an infrequent injury, typically occurring in male patients under the age of forty. The incidence of simultaneous rupture of the ACL and patellar tendon, without involvement of other ligaments of the knee, is even rarer, with its occurrence in the literature limited to case reports. Rae and Davies reported on a female who ruptured the medial collateral ligament (MCL), ACL, and patellar tendons. Only the MCL and patellar tendon were repaired. Levakos and colleagues described six cases in which both the ACL and patellar tendon were ruptured. A patellar tendon injury was missed on initial diagnosis in two patients and an ACL injury was missed on initial diagnosis in two other patients. Four patients had concomitant MCL injuries. Three patients had tears of both the medial and lateral meniscus, while one patient had an isolated tear of the lateral meniscus. Only two patients had the patellar tendon and ACL rupture repaired during the same operation. Our case is unique because the ACL and patellar tendon tears were diagnosed at the initial presentation and a hamstring autograft was used to reconstruct the ACL.

Rupture of the patellar tendon can occur when the tendon is so weakened that it is susceptible to movements that would not typically affect a healthy tendon. A historical study of the changes that occur in patellar tendons prior to rupture revealed that there is usually evidence of degenerative changes. Degeneration in the patellar tendon can be due to systemic diseases that weaken collagen structures, such as diabetes mellitus, systemic lupus erythematosus, rheumatoid arthritis, chronic renal failure, long-term systemic corticosteroid therapy, and local steroid injection near the patellar tendon. Degeneration can also result from repetitive microtrauma to the knee, which can occur in sporting activities and which results in patellar tendonitis or “jumper’s knee.” This patient had a history of active participation in football, basketball, tennis, and skiing. Furthermore, he was previously symptomatic from patellar tendonitis in a visit prior to his injury.

The treatment of choice for a ruptured patellar tendon is immediate repair. The most commonly described procedure is primary end-to-end repair, with or without reinforcing cerclage. Delaying operative treatment can result in persistent quadriceps atrophy as well as limitation of full flexion. Also, quadriceps contraction and further degeneration and scarring of the ruptured ends of the tendon, as well as proximal migration of the patella, may complicate delayed treatment. While staged reconstruction of the ACL was an option, simultaneous procedures offered the advantages of a single operative procedure with parallel healing. Reproducing the strength of the native ACL and restoring the kinematics of the intact knee are the ultimate goals of ACL reconstruction. Part of the selection criteria for a hamstring autograft as a graft material for this case was based on the desire to limit further violation of the knee extensor mechanism (i.e., quadriceps autograft). Certainly, in this case, the use of the ipsilateral patellar tendon was not an option. Contralateral knee grafts were avoided to prevent potential graft morbidity to the unaffected knee. Allograft tissue has the benefit of limiting morbidity of the knee but at the expense of slower graft incorporation, and allograft material was not desired by the patient.
With a combined patellar tendon and ACL injury, the rehabilitation differs from when each of these injuries occur in isolation. The rehabilitation is limited by the patellar tendon protocol, which differs from the isolated ACL reconstruction protocol. The patellar tendon repair postoperative protocol was essentially followed in this patient. For reconstructed ACLs, the postoperative rehabilitation program is as important a prognostic factor as repaired tears of either the MCL or lateral collateral ligament (LCL) for ultimate recovery. Indeed, loss of knee function and development of arthrofibrosis can result if rehabilitation is delayed. Aggressive postoperative rehabilitation typically includes immediate weightbearing as tolerated with a brace, active and passive range of motion to restore range of motion, and closed-chain exercises, which are favored over open-chain exercises since they protect the graft through use of the contours of the knee. Because rehabilitation of a patellar tendon rupture is more conservative than that for ACL reconstruction, the patient was treated with a modified rehabilitation course. This patient was immobilized in full extension for six weeks at which time he was advanced to partial weightbearing and physical therapy was begun. This modified rehabilitation program proved to be successful for this patient as he was able to complete an Ironman competition three years after his operation.

In summary, combined ACL and patellar tendon ruptures may be addressed by simultaneous reconstruction of the ACL with autogenous hamstring tendons and primary repair of the patellar tendon. The simultaneous technique with autogenous hamstrings has the benefit of avoiding graft harvest from the contralateral knee, avoiding allograft use, and allowing both procedures (patellar tendon and ACL reconstruction) to be conducted simultaneously.

References