

CASE REPORT

Popliteus tendon rupture: a case report and review of the literature

A R Guha, K A Gorgees, D I Walker

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Isolated rupture of the popliteus musculotendinous unit is an uncommon injury. A case is here reported of a semi-professional athlete with a ruptured popliteus tendon without significant instability of the knee. The diagnosis was made by magnetic resonance imaging and confirmed by arthroscopy.

Isolated rupture of the popliteus musculotendinous unit is an uncommon injury. Popliteus ruptures are usually associated with acute or chronic posterolateral instability of the knee.^{1,2} In these cases the injury is extensive and may include disruption of the arcuate ligament complex, the lateral collateral ligament, both cruciates, and the menisci.^{1,3} We present a case of a semiprofessional athlete who had rupture of the popliteus tendon without significant instability of the knee. The diagnosis was made by magnetic resonance imaging (MRI) and confirmed by arthroscopy.

CASE REPORT

A 23 year old semiprofessional footballer sustained an injury to his left knee during a game. He was kicked on the lateral aspect of the knee while the leg was in the air. Immediately after impact, he had sharp pain on the lateral side of the knee. The mechanism of injury was thought to be sudden forcible external rotation of the tibia in a partially flexed knee. He was unable to continue with the game and had to limp off the field. The knee swelled up and remained painful despite anti-inflammatory drugs and ice packs. Three days after he sustained the injury, he sought specialist attention. Three years before, he had had a partial rupture of the anterior cruciate ligament in the same knee. This was treated conservatively after arthroscopy had shown an intrasubstance tear of the anterior cruciate ligament. He made a full recovery and played regular club football as a semiprofessional.

Physical examination showed considerable tenderness on the lateral joint line and posterolateral corner of the knee. He had a grade I effusion in the knee with pain in the terminal ranges of movement. The knee was stable to varus and valgus stress in extension and varying degrees of flexion, and there



Figure 1 T1 weighted sagittal magnetic resonance scan showing attenuation of the proximal attachment of the popliteus.

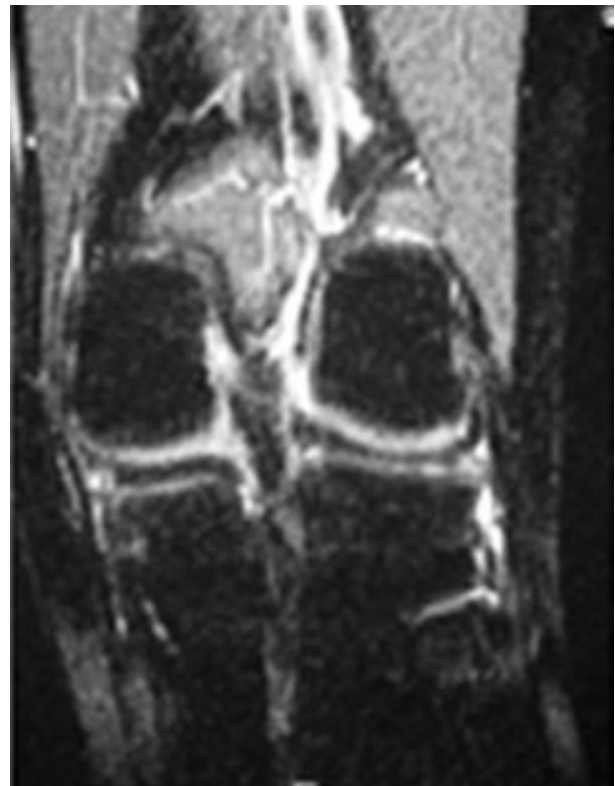


Figure 2 STIR sequence coronal scan showing irregularity of the popliteus tendon with surrounding oedema of high signal intensity.

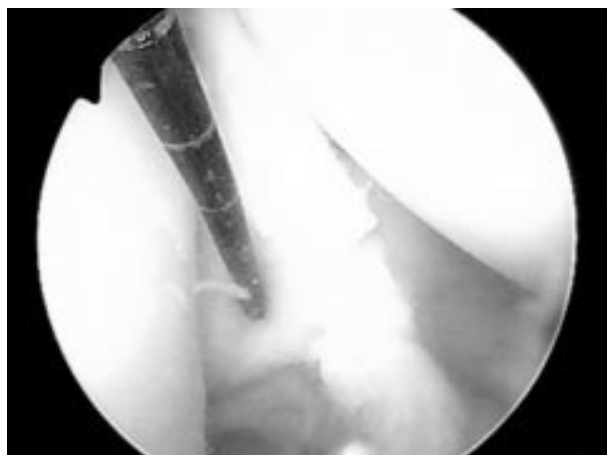


Figure 3 Arthroscopic view of empty lateral gutter of the knee (ruptured popliteus tendon had retracted distal to the popliteal hiatus).

was no increase in passive external rotation in flexion. He had Lachman grade 1 laxity of the anterior cruciate ligament as a result of the previous injury. Radiographs of the knee were completely normal. An MRI scan of the knee was obtained: visualisation was incomplete, with attenuation of the proximal attachment of the popliteus tendon suggestive of a rupture (figs 1 and 2). Arthroscopy of the knee was undertaken and the haemarthrosis was washed out. On examination of the lateral gutter, a complete tear of the popliteus was confirmed. The tendon had retracted through the popliteal hiatus and was not visualised in the joint (fig 3). No capsular injury was detected and the anterior cruciate ligament was found to be in continuity with some laxity of the fibres. No further surgery was performed. The knee was put through a rehabilitation programme, and six weeks after the arthroscopy, the patient was able to resume playing football. One year later, the knee continues to be stable and free of pain with full range of movement.

DISCUSSION

The popliteus musculotendinous unit is unique in that the distal muscular attachment is designated the insertion and the tendinous proximal (femoral) attachment is designated the origin.⁴ The muscle inserts into a triangular area along the posteromedial aspect of the proximal tibial metaphysis above the soleal line.³ It forms the floor of the popliteus fossa.⁶ The tendon of the popliteus passes through the popliteal hiatus, entering the knee joint and inserting into the lateral femoral condyle at the end of the popliteal sulcus. As it courses through the knee, covered by a thin layer of synovial membrane, it is easily visualised during arthroscopy. The main tendinous component inserts into the lateral femoral condyle with variable aponeurotic attachments to the posterior horn of the lateral meniscus and the fibular head.^{2,7,8} The insertion into the lateral meniscus retracts and protects the meniscus in flexion, but this function has been disputed.^{8,9} The phylogenetic development of the popliteus muscle is probably responsible for the many reported variations in the insertions of its tendon.⁸ In lower vertebrates, the fibula articulates directly with the distal femur with a “fibular” meniscus, and the major attachment of the popliteus is to the fibular head.⁷ With phylogenetic progression, the fibular meniscus augments the posterior tendinous portion of the popliteus and blends into it as the fibular head migrates distally to its non-articular position in humans.

Various static and dynamic functions have been attributed to the popliteus, including “unlocking” of the knee joint,¹⁰ initiation and maintenance of internal rotation of the tibia on the

Take home message

- A complete arthroscopic examination of the knee should include visualisation and probing of the popliteus through the lateral gutter. A ruptured popliteus tendon can retract through the popliteal hiatus and may not be visualised in the joint.
- In patients with an acute haemarthrosis and posterolateral pain in a stable knee, the diagnosis of popliteus tendon rupture should be suspected.
- In a clinically stable knee, popliteus tendon rupture detected by MRI may be successfully treated conservatively.
- Surgery on isolated injuries of the popliteus musculotendinous unit is probably not warranted.

femur,^{1,2,6,9} and preventing forward dislocation of the femur on the tibia during initial flexion.² It is the only muscle that has sufficient mechanical advantage to produce internal rotation of the tibia on the femur during gait.¹¹ It is said to be an important static stabiliser of the posterolateral corner, acts as a secondary restraint to posterior displacement of the tibia in posterior cruciate ligament deficient knees,¹² and produces an active pivot shift if electrically stimulated.⁹ In our case, however, when the joint was stressed, the other posterolateral structures compensated for the lack of the popliteus and maintained the stability of the joint.

An acute haemarthrosis and lateral pain in a stable knee should lead to suspicion of an isolated injury to the popliteus muscle-tendon unit.⁹ The diagnosis should be entertained in any acutely swollen knee with posterolateral tenderness and pain on resisted internal tibial rotation.² MRI of the knee should be performed to evaluate the nature of the injury. The diagnosis may be confirmed by arthroscopic examination of the knee. In some cases, the ruptured popliteus tendon retracts distally through the popliteal hiatus and can no longer be seen in the joint.^{7,12,13}

MRI is helpful in the evaluation of complex knee injuries. Some authors have suggested that the posterolateral structures of the knee may be better visualised by using a coronal oblique plane slanted parallel to the direction of the popliteus tendon,¹⁴ whereas others have recommended a standard knee protocol using high contrast images with fat suppression.^{3,5} Popliteus musculotendinous injuries are detected in 1% of all knee MRI examinations,⁵ commonly associated with damage to other posterolateral structures. Most of these popliteus ruptures are extra-articular, involving the muscular or musculotendinous portion but they can be intra-articular, at the level of the popliteal hiatus or at the femoral insertion.^{5,14} Fewer than 10% of popliteus injuries are isolated.^{5,14} They may appear on MRI as an avulsion of the tendon from its femoral attachment, an irregular contour of the tendon at the popliteal hiatus with surrounding high signal intensity changes due to oedema, or as swollen disorganised muscle fibres with high signal intensity changes within the popliteus muscle.^{5,14}

The high frequency of popliteus musculotendinous ruptures or avulsions in association with other lateral and posterolateral ligamentous knee injuries has been reported previously.^{2,15} In these cases, surgical reconstruction is necessary to prevent acute or chronic posterolateral instability. Owing to the complex anatomy of the posterolateral corner of the knee, surgery in this area is not without complications. It has been recommended that any surgeon undertaking operative procedures in this region should first study the surgical anatomy in the anatomy laboratory and perform the procedure there.¹⁵

The treatment of isolated popliteus tendon ruptures has, however, not been very well defined. Review of the literature

shows 15 cases^{1-4 9 10 12 13 16}; four were treated conservatively; in one case the avulsed chondral fragment was excised without repair of the popliteus tendon¹³; in the remaining 10 cases, the tendon was repaired. In nine of these 10 cases, there was an osteochondral fracture as a result of avulsion of the tendon from the femoral attachment, and this fragment was repositioned and fixed with screws. In the other case, an attenuated intrasubstance tear was found in the tendon and this was repaired with non-absorbable sutures. The knee was then protected in a brace or cast for four to six weeks. It is noteworthy that in eight of these 10 cases, there was no instability on stress testing of the knee before the repair of the popliteus. In one case, the knee had minimal varus laxity at 30° of flexion, and in the last, there was subtle but clinically detectable posterolateral instability.³ In all the four cases treated conservatively, as well as in the case where the avulsed chondral fragment was excised without repair of the retracted popliteus tendon, good functional results were obtained. Long term follow up of these patients would further establish the efficacy of conservative treatment of popliteus musculotendinous unit injuries.

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Authors' affiliations

A R Guha, K A Gorgees, D I Walker, Department of Orthopaedics, Rochdale Infirmary, Whitehall Street, Rochdale, Lancashire, UK

Correspondence to: Mr Guha, Department of Orthopaedics, Rochdale Infirmary, Whitehall Street, Rochdale OL12 0NB, UK; billguha@hotmail.com

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