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Case Report

Grade III distal medial collateral ligament rupture co-existing with transient lateral patellar dislocation ☆

Ruhaid Khurram, MBBS, FRCR, Rashed Al-Khudairi, MBBS, FRCR, Thomas M Armstrong, MBBS (Hons), FRCR*

Royal Free London NHS Foundation Trust, London, UK

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ABSTRACT

Lateral patellar dislocations are the second most common type of traumatic knee injury, accounting for approximately 2-3% of cases, the most common being anterior cruciate ligament (ACL) injury. There are several well-documented anatomical risk factors predisposing to patellofemoral instability for example: patella alta, trochlear dysplasia, ligamentous laxity, and genu valgum. Co-existing medial collateral ligament injury in cases of patellar dislocations in the absence of ACL injury is uncommon and infrequently reported in the literature. The authors present a case of a 14-year-old boy presenting with a left knee injury while playing football who was diagnosed on magnetic resonance imaging (MRI) with a transient lateral patellar dislocation, high-grade medial patellofemoral ligament (MPFL) injury and a full thickness (grade III) injury to the distal medial collateral ligament.

Introduction

Acute patellar dislocation is the second most common cause of knee hemarthrosis due to trauma and accounts for approximately 2%-3% of all knee injuries [1]. Magnetic resonance imaging (MRI) is a useful modality to diagnose the condition due to the characteristic bone contusion pattern involving the medial patellar facet and lateral femoral condyle. Also, it serves as a way to assess for potential anatomical risk factors for patellofemoral instability [2]. These include patella alta, trochlear dysplasia, medial patellofemoral ligament (MPFL) laxity, other supporting ligamentous laxity, genu valgum, abnormal Q angle, and iliotibial band dysfunction [2–4].

Co-existing distal medial collateral ligament (MCL) injury and patellar dislocation are uncommon; specifically grade III MCL injuries in this context are very rarely reported in the literature. We report a case of a 14-year-old boy with a recent football injury to the left knee with concomitant transient lateral patellar dislocation and a grade III distal rupture of the

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* Corresponding author.
E-mail address: ruhaidk@gmail.com (R. Khurram).

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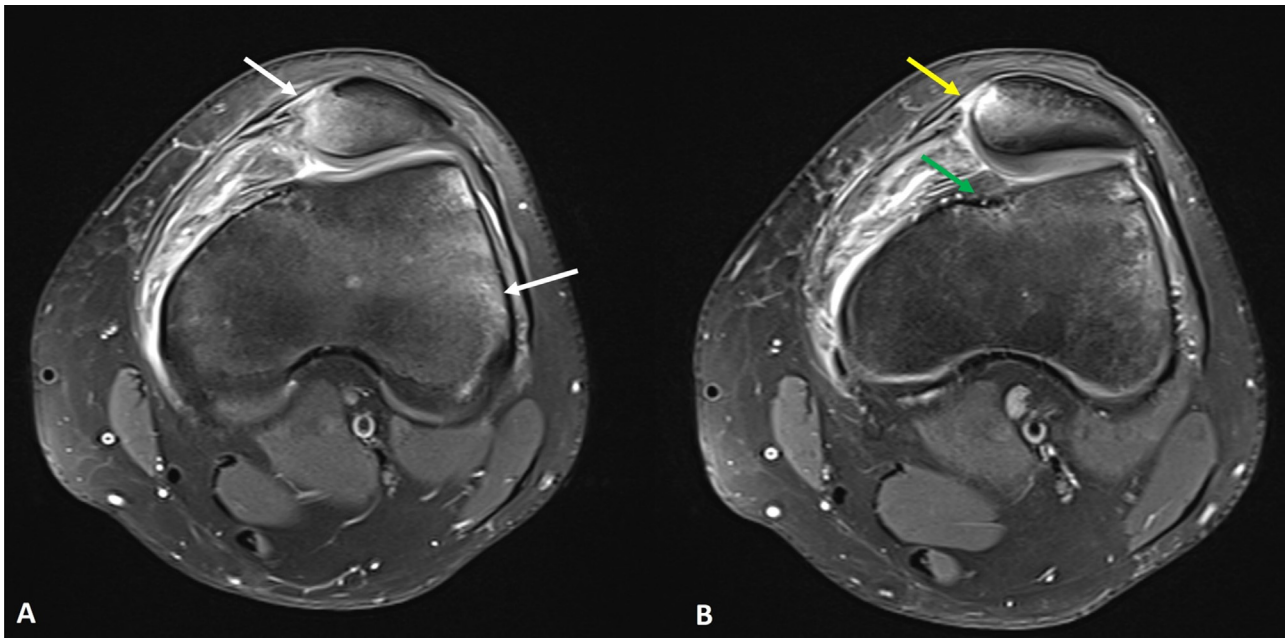

Fig. 1. – (A) Axial proton density (PD) fat-suppressed image showing a classic contusional pattern of lateral patellar dislocation with bone marrow edema at the medial patellar facet and lateral femoral condyle (white arrows). (B) Discontinuous MPFL at the patellar insertion in keeping with high-grade partial thickness injury (yellow arrow). A note is made of trochlear dysplasia with medial facet hypoplasia (green arrow).

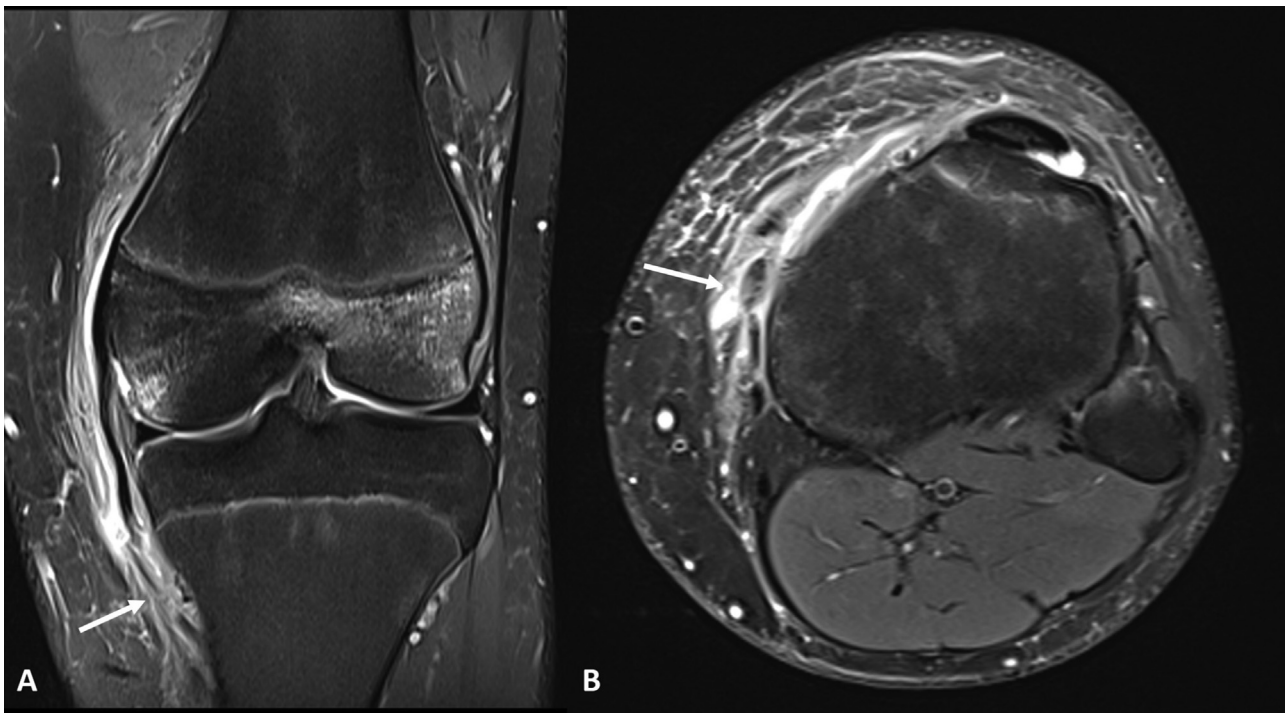

Fig. 2 – (A) Coronal PD fat-suppressed and (B) Axial PD fat-suppressed image illustrating a full-thickness disruption (grade 3) of the distal medial collateral ligament (MCL) fibers near the medial tibial insertion (white arrows).

Fig. 3 – Sagittal PD fat-saturated sequence demonstrating borderline patella alta with a Modified Insall-Salvati ratio of 1.54 (yellow arrows).

MCL in association with a more commonly recognized high-grade MPFL injury.

Case report

This 14-year-old boy was referred to the orthopedic clinic and described a "twisting" mechanism of injury due to a tackle from behind as the patient's foot was planted on the floor and knee flexed. The knee instantly became swollen with immediate cessation of play. The patient attended his local community hospital where radiographs were performed which showed no evidence of a Segond or arcuate fracture. The sole positive finding was a joint effusion.

Clinical examination of the left knee demonstrated significant soft tissue swelling and a large suprapatellar effusion. The patient had a painless range of motion from 15 to 85 degrees after which pain symptoms occurred particularly localized to the medial aspect of the knee. Clinically, his extensor mechanism was intact and he also had an intact neurovascular status.

He was provided with a locked knee brace from 20 to 90 degrees and an urgent MRI knee was requested to evaluate for ligamentous and meniscal damage.

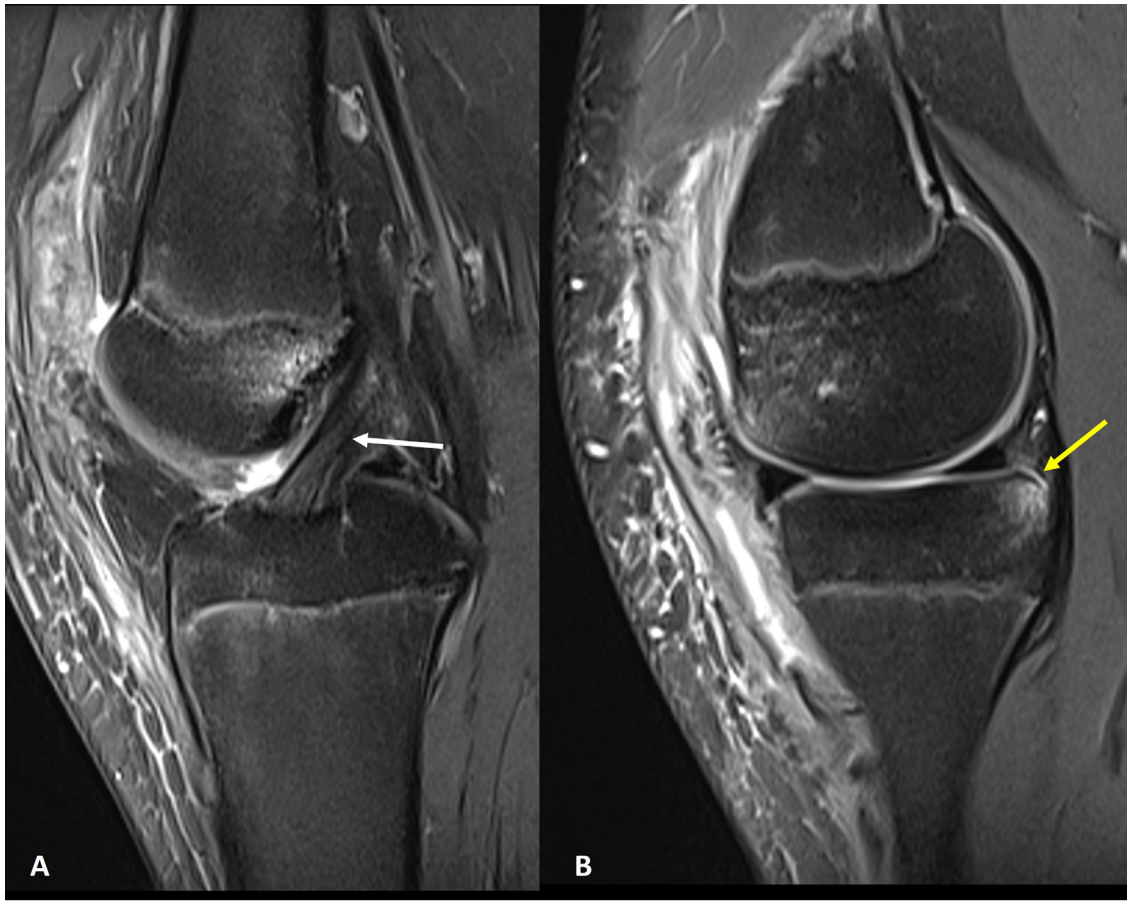

Fig. 4 – (A) Sagittal PD fat-saturated sequence depicting an intact ACL (white arrow). (B) Intact medial meniscus with a small contusion seen at the posteromedial aspect of the tibia in keeping with a low-grade posteromedial corner contusion (yellow arrow).

MRI knee revealed evidence of recent lateral patellar dislocation with bone marrow contusions at the medial patellar facet and at the lateral femoral condyle. There was high-grade injury to the medial patellofemoral ligament (MPFL) which appeared partially discontinuous at the patellar origin (Fig. 1). In addition, there was a full-thickness disruption (grade 3) of the distal MCL fibers with ligamentous laxity and hematoma formation (Fig. 2).

There was evidence of trochlear dysplasia with a hypoplastic medial facet (Dejour type C) with, borderline patella alta (Modified Insall-Salvati Ratio: 1.54) as well as an increased tibial tuberosity to trochlear groove (TT-TG) distance of 21 mm (Fig. 3) which predisposes the patient to patellofemoral maltracking.

The ACL, PCL, and lateral collateral ligament (LCL) were intact. There was no evidence of meniscal injury, acute osteochondral injury, or intra-articular chondral body (Fig. 4).

The patient was subsequently re-reviewed in an orthopedic clinic and was reassured that ligamentous injuries and an isolated transient lateral patellar dislocation are likely to improve and resolve with physiotherapy. The patient and family were advised that if recurrent dislocations occur this surgical treatment may be required in the future.

He was referred to physiotherapy and had an excellent response to treatment whereby his knee pain resolved and overall function returned back to normal within 6 months.

Discussion

The primary function of the MCL is to resist valgus forces. The ligament is layered, consisting of the superficial and deep components of the ligament. The superficial MCL has its proximal attachment at the posterosuperior aspect of the medial femoral epicondyle and distal attachment at the medial upper tibia, with varied blending with other medical retinacular structures distally. The deep MCL is divided into the meniscofemoral and meniscotibial (coronary) ligaments [5]. Injury to the MCL is often associated with pivot-shift injury mechanisms with co-existing injury to the anterior cruciate ligament (ACL) and medial meniscus, thereby forming the well-documented O'donoghue's ("terrible") triad [6].

In addition, the MCL forms part of the medial capsuloligamentous complex of the knee; a multilayered ligamentous structure which biomechanically provides support to

the patella and helps maintain its position during strenuous forces. The 3-layered system described by Warren et al. [7] is the accepted method of anatomically describing the medial aspect of the knee joint. Layer 1 (superficial layer) compromises the crural fascia. Layer 2 (middle layer) consists of the superficial MCL, MPFL, and posterior oblique ligament. Layer 3 (deep layer) contains the deep MCL, meniscotibial (coronary) ligaments, and the contributions from the joint capsule [8].

Although injury to the MPFL in the context of lateral patellar dislocation is a well-documented finding, which can involve the proximal attachment of the MCL, co-existing distal MCL rupture and patellar dislocations are uncommonly reported in the literature. A study by Quinlan et al. [9] assessed the integrity of the MCL on MRI in patients with transient lateral patellar dislocation and showed that 40/80 (50%) of patients were diagnosed with a MCL injury however complete rupture/grade III injury was uncommon involving only 3/80 (4%) of patients. Similarly, Collins et al. [10] stated that 90% of patients with clinically and MRI proven MCL injury had abnormal signal characteristics and appearance of the MPFL, however, no patients in their study had concurrent lateral patellar dislocation and did not develop patellar instability symptoms.

A study on a cohort of surgically repaired severe MCL injuries by Hunter et al. [11] reported a 21% (40/189 patients) incidence of disruption to the vastus medialis oblique (VMO) muscle, therefore concluding that there is a strong link between MCL injury and VMO damage. This is likely due to the close anatomical relationship and variable blending of these 2 structures as the superficial MCL origin at the medial femoral epicondyle is closely associated with the insertion of the VMO. Furthermore, the MPFL fibers are intimately related and fuse with the undersurface of the VMO. This close anatomical proximity can therefore explain how direct valgus stress to the knee can cause simultaneous injury to both the MCL and MPFL, particularly at the femoral insertion of both structures, the latter thereby propagating a lateral patellar dislocation. This concept was suggested by Hermans et al. [12] in a case report of a 41-year-old patient with chronic grade III MCL injury at the femoral insertion, MPFL incongruity, and characteristic bone bruising of lateral patellar dislocation. Interestingly, in our case report, the MCL rupture involved the distal fibers near the medial tibial insertion and the MPFL injury was at the patellar insertion hence, a further distinct type of injury pattern. The patient in our case report did have features of patella alta and trochlear dysplasia, thereby increasing the risk of lateral patellar dislocation, and therefore the co-existing injury is likely due to shared abnormal valgus stresses.

A large majority of MCL injuries, even high grade, can be managed nonoperatively with rest, analgesia, extension braces, and physiotherapy allowing scarring/healing of the fibers with good functional outcomes and negating operative risks. Occasionally, surgical repair is required for patients who develop chronic medial knee laxity despite conservative measures or in highly active individuals or professional sports persons. Further indications for surgical MCL repair include significant bone avulsions, associated tibial plateau fracture, Stener-type lesion (interposition of the pes anserine muscles between the tibia and the MCL), multiligamentous injury and open MCL injury [13].

In summary, this case highlights an uncommon occurrence of a complete distal MCL rupture (grade III injury) co-existing with lateral patellar dislocation. More commonly, the proximal fibers of the MCL may be involved due to the layered blending of the MPFL, medial retinacular fibers, and the proximal MCL in combination. It is therefore pertinent for radiologists to closely assess the integrity of the distal MCL on MRI for subtle injury in patients with MRI features and risk factors of transient lateral patellar dislocation so that this important injury is recognized which can have implications for optimal rehabilitation and recovery.

Patient consent

Written informed consent was obtained from the next of kin of the patient described in this case report for the use of clinical data and medical images pertinent to the case.

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