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Delayed diagnosis of an isolated posterolateral corner injury: a case report

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Introduction: *Isolated injuries to the posterolateral corner of the knee are a rare and commonly missed injury associated with athletic trauma, motor vehicle accidents, and falls. Delayed or missed diagnoses can negatively impact patient prognosis, contributing to residual instability, chronic pain, and failure of surgical repair to other ligaments.*

Case Presentation*: A 44-year-old male CrossFit athlete presented with a history of two non-contact hyperextension injuries to his left knee while walking on ice. The only positive finding was the Dial Test at 30 degrees of knee flexion, indicative of an isolated posterolateral corner injury. After a delay in diagnosis, the patient underwent a reconstruction of the posterolateral corner and subsequent rehabilitation. Early recognition of this injury is important as this can affect the prognosis and activities of daily living of the patient.*

Introduction: *Les lésions isolées du point d'angle postéro-externe du genou sont une blessure rare et fréquemment manquée associée à un traumatisme sportif, à des accidents de véhicule automobile et à des chutes. Les diagnostics tardifs ou ambigus peuvent avoir un impact négatif sur le pronostic du patient, ce qui contribue à l'instabilité résiduelle, à la douleur chronique et à l'échec de la réparation chirurgicale à d'autres ligaments.*

Exposé de cas : *Un athlète CrossFit masculin de 44 ans s'est présenté avec deux lésions d'hyperextension sans contact de son genou gauche qui se sont produites alors qu'il marchait sur la glace. Le seul résultat positif a été le test d'hypermobilité externe (Dial test) à 30 degrés de flexion du genou, indiquant une lésion isolée du point d'angle postéro-externe. Après un retard dans le diagnostic, le patient a subi une reconstruction du point d'angle postéro-externe et une réadaptation subséquente. Le diagnostic précoce de cette lésion est important, car cela peut affecter le pronostic et les activités de la vie quotidienne du patient.*

Résumé : *Ce cas traitera du tableau clinique, des*

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Patient consent was obtained for the use of clinical information and imaging with respect to this case report.

Summary: *This case will discuss the clinical presentation, diagnostic procedures, and management of an isolated posterolateral corner injury and highlight the importance of early recognition and referrals from primary contact healthcare practitioners.*

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KEY WORDS: chiropractic, knee, posterolateral corner injury, rehabilitation, Dial test

procédures diagnostiques et de la prise en charge d'une lésion isolée du point d'angle postéro-externe et soulignera l'importance du diagnostic précoce et des références des professionnels de soins de santé primaires.

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MOTS CLÉS : chiropratique, genou, lésion du point d'angle postéro-externe, réadaptation, test d'hypermobilité externe

Introduction

Injuries to the posterolateral corner (PLC) of the knee occur in 16% of knee injuries[1] and are most commonly associated with athletic trauma, motor vehicle accidents, and falls[2]. Isolated injury to the PLC occurs in 2% of acute knee injuries.[1] The PLC is comprised of numerous muscular and ligamentous structures, making this a complex anatomical region,[3] however it is most commonly cited that the 3 primary structures which comprise the PLC are the fibular collateral ligament (FCL), popliteus tendon, and popliteofibular ligament (PFL).[4,5] Biomechanically, the PLC structures primarily restrain tibial varus, external rotation, and posterior translation movement. Accordingly, injury to this area of the knee occurs with blows to the anteromedial thigh, contact and non-contact hyperextension, a valgus force to a flexed knee, and severe tibial external rotation with a flexed knee.[6] Delayed or missed diagnoses can negatively impact patient prognosis, contributing to residual instability, chronic pain, and failure of surgical repair to other ligament grafts.[7,8] This report highlights the clinical presentation, diagnostic procedures, and necessity of early recognition in an isolated PLC injury.

Case Presentation

A 44-year-old male CrossFit athlete presented with a history of two non-contact hyperextension injuries to his left knee while walking on ice. The patient complained of intermittent instability and decreased confidence while descending stairs. On initial presentation, there was full range of motion (ROM) of the knee, mild pain in the posterolateral aspect of the knee, and no joint effusion. The only orthopaedic finding was mild laxity of the posterior drawer test compared to the contralateral limb. Tests for tibial rotational laxity were not performed at the initial assessment. The mechanism of injury and initial examination had lead to a diagnosis of a mild knee sprain.

At 3 months into his rehabilitation, the patient had noted muscle weakness and atrophy of the quadriceps; symptoms of instability since the onset of injury; decreased confidence descending stairs and walking on uneven ground; and the inability to engage in Olympic lifting. At that point, magnetic resonance imaging (MRI) was performed which showed high signal intensity in the anterior aspect of the lateral femoral condyle, suggestive of bone marrow edema. The FCL, PFL, popliteus tendon, and all other osseous and soft tissue structures were reported to be normal. Due to continued symptoms of instability and functional disability, the patient requested referral to an orthopaedic surgeon. Upon physical examination, the surgeon noted a mild varus angulation of the patient's legs. Range of motion revealed full knee flexion and extension. There was no varus thrust gait, effusion, or joint line tenderness present, however, there was tenderness over the FCL when the knee was placed in the combined flexion, abduction, and external rotation position. There was increased tibial posterior translation and external rotation on the affected side at 30 degrees of knee flexion, constituting a positive Dial test. The Dial test at 90 degrees was negative. Reverse Lachman and reverse pivot shift tests also demonstrated posterolateral laxity compared to the contralateral limb. His posterior cruciate ligament (PCL), anterior cruciate ligament (ACL), and medial collateral ligament (MCL), were within normal limits during ortho-

paedic testing. Varus stress radiographs performed at 20 degrees of knee flexion did not reveal any coronal plane instability of the FCL, as there was no side-to-side difference in joint gapping. Plain radiographs were within normal limits.

Based on the history and physical examination, the patient was diagnosed with PLC deficiency. The patient underwent a knee arthroscopy, which confirmed the presence of laxity in the PLC. The grading of the injury at the time of the surgery was not provided, however the surgeon commented that due to the time since the injury, the PFL and popliteal tendon had healed but continued to demonstrate laxity, seen as increased space in and around the posterolateral corner during the arthroscopy. The LCL was completely intact. He received a popliteus graft and common peroneal nerve neurolysis and transposition. The surgical procedure occurred 15 months after the initial injury. Post-surgical rehabilitation followed an approach similar to a PCL protocol[9] with touch weight bearing for six weeks, pain and edema management, and progressive strengthening. The patient reported gradual improvements in strength over a 6-month period, but he continued to experience some difficulties returning to Olympic lifting.

Discussion

It has previously been suggested that the incidence of PLC knee injuries is under-reported.[6,10] In a prospective MRI study by LaPrade *et al*.[1], the authors investigated the incidence of various ligamentous injuries in knees presenting with hemarthrosis. It was found that 16% of PLC injuries occur in combination with other ligamentous injuries. The most common other ligaments injured with the PLC are the PCL, followed by the ACL. The PLC will be injured in isolation only 2% of the time[1], highlighting the rare presentation in this case.

There are many signs and symptoms associated with injuries to the PLC. Specifically, there are five signs and symptoms that can be noted before a hands-on examination is performed, including mechanism of injury, location of pain, involvement of the common fibular nerve, complaints of knee instability, and abnormal gait.[2]

The mechanisms most commonly associated with injury to the PLC include posterolateral forces to the anteromedial thigh, contact and non-contact hyperextension, a valgus force to a flexed knee, and severe tibial external rotation with a flexed knee.[6] Different structures in the PLC will be affected depending on the degree of knee flexion at the time of injury. Contact and non-contract sports involving pivot motions are most likely to encounter PLC injuries. An injury to the PLC should also be considered in the presence of injuries to the PCL and ACL.[2]

Upon initial injury to the PLC, patients may report lateral or medial joint line tenderness, however there is commonly a diffuse tenderness over the posterolateral knee and the fibular head due to irritation of the PLC structures, knee capsule, and common fibular nerve. Patients may also present with neurological symptoms as it has been reported that the common fibular nerve is injured in 13% of PLC injuries.[6] Therefore, clinicians need to perform a thorough examination of the deep and superficial fibular nerves for both sensory and motor function.[11] PLC injury may lead to patient complaints of instability. The patient may describe a "give-way" sensation into hyperextension with stairs or hill walking and have apprehension to pivoting or cutting motions.

Due to the rotary instability of the knee, an abnormal gait pattern may develop which the patient cannot compensate for. During the initial contact and loading phase of gait, the knee may suddenly angulate in a varus direction (known as a varus thrust gait), which also loads the medial compartment of the knee. Over time, this continued stress on the medial compartment may expedite the degenerative process in the knee.[12,13]

A heightened index of suspicion for a PLC injury should be considered when the above-mentioned signs and symptoms are present. A complete physical examination of the knee should be included to rule out other intra-articular and cruciate ligament injuries. However, the following procedures should be used to assess posterolateral rotational laxity. The Dial Test is a measure of posterolateral rotational laxity of the knee.[2,14] The patient is placed in the supine position, hips and knees flexed to 90 degrees, ankle in dorsiflexion, and the foot is used to rotate the tibia until a hard end-range is felt (Figure 1). A positive test is indicated when there is an increase in rotational laxity on the affected side. In a cadaveric study investigating tibial rotation laxity, a 10-15 degree difference is significant between legs with specific sectioning of the three PLC structures.[15] Furthermore, a positive Dial Test at 30 degrees suggests an isolated PLC injury, while at 90 degrees suggests involvement of the PCL. To date, no

Figure 1.
Dial test performed in the supine position. In this image, increased laxity into tibial external rotation of the subject's right leg indicates a positive dial test at 30 degrees of knee flexion, suggestive of an isolated posterolateral corner injury. If the dial is also positive at 90 degrees of knee flexion, this suggests involvement of the PCL.

study has investigated the sensitivity or specificity values of this test.[2] The accuracy of this test can also be affected by injury to the MCL which resists anteromedial rotation of the knee[16], so the possibility of injury to this ligament must also be considered. Other tests of rotational laxity of the knee include the external rotation recurvatum test, reverse-pivot shift, posterolateral drawer, and standing apprehension test.[2] While this case highlights an isolated PLC injury, it is important to consider potential damage to the anterior and posterior cruciate ligaments as 87% of PLC tears occur as part of multi-ligament injury spectrums.[1] MRI should be utilized for suspected cases of PLC injury. Coronal oblique planes should be included in order to adequately display the PLC structures.[2] In this case, the FCL was fully intact (Figure 2) and due to inadequate visualization of the PFL and popliteus tendon, the diagnosis of PLC deficiency was delayed. It has been previously reported that the sensitivity of MRI to detect PLC injuries is low, with values of 57.58% for detecting FCL injury and 24.24% for detecting popliteal tendon injury.[17] Furthermore, a second opinion of the MRI in this case was also inconclusive for PLC injury, which was not detected until the arthroscopy was performed. This highlights that the absence of positive findings on MRI do not confirm the absence of pathology.[17] To obtain better visualization of the PLC, specific protocols should be used including coronal oblique and sequence views, and the scans should be performed in the acute injury phase, which may increase the accuracy of the study.[17]

The time between initial injury and surgery was 15

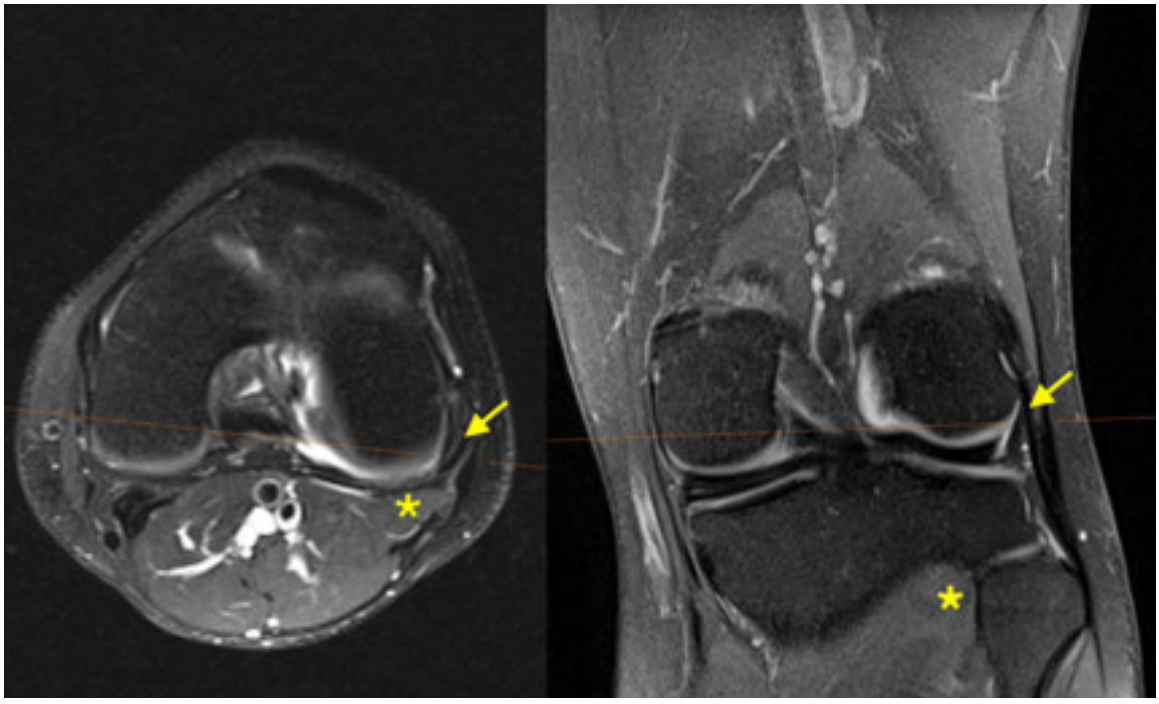

Figure 2.
Axial (left) and coronal (right), proton-density, fat-suppressed image of the patient's left knee unremarkable for posterolateral corner injury. A positive finding would be high intensity signal at the FCL (arrow) and popliteus tendon (asterisk).

months due to a combination of low index of suspicion clinically, inconclusive MRI results, and lack of access to a knee specialist. This delay caused the patient significant functional disability and muscle atrophy, which may have been avoided with early clinical recognition. While a recent systematic review suggests that acute and chronic PLC injury repairs have similar success rates at 83% and 90% respectively, there is an increase risk of injury to other ligamentous structures in the pre-surgical period.[18,19] Noyes and Westin[8] reported that 40% of PCL injuries occurred due to deficiencies of the PLC, therefore recognizing an injury to the PLC may decrease the likelihood of causing further damage to other structures in the knee.

Classification of PLC tears is based on the Fanelli Scale with increased grades indicating increased number of structures involved.[2] While most Grade III tears to the FCL are managed surgically due to better outcomes[7], Grade I and II tears may be managed conservatively. There is inadequate evidence highlighting surgical repairs to the popliteal tendon in the absence of tears of the FCL. There is also a paucity of literature supporting the conservative management of isolated PLC tears due to its low prevalence. PLC injuries that occur with other ligament tears typically follow the rehabilitation protocol of the primary ligament that has been damaged. Experts advocate standard pain and edema management initially, followed by progressive rehabilitation based on anthropometrics, function, and symptom resolution.[2]

Summary

This case highlights the need for a high index of suspicion for a PLC injury when the mechanism and clinical findings support the diagnosis, even in the absence of MRI findings. While the evidence supports surgical methods for Grade III tears, further research on rehabilitation in conservative cases is needed.

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