Bianca Scotney

Sports knee injuries

Assessment and management

Background

Sports knee injuries present commonly in the general practice setting. A good understanding of the anatomy and biomechanics of the knee assists accurate diagnosis of acute knee injuries.

Objective

This article describes the assessment and management of sports knee injuries in the general practice setting.

Discussion

When a patient presents with a sporting knee injury, a detailed history can help narrow down the nature of the injury. Examination can be difficult in the acute setting and may need to be repeated 3 or more days after the injury. Fractures can usually be excluded with plain X-rays; where indicated MRI or CT scan will usually confirm the diagnosis. Management aims are to manage pain, minimise knee swelling, maintain range of movement and quadriceps activation, and arrange appropriate referral. Medial collateral ligament, posterior cruciate ligament and some small meniscal injuries can usually be managed conservatively. Most meniscal injuries, anterior cruciate ligament and lateral collateral ligament injuries require surgical management. Physiotherapy is an integral part of the management of knee injuries in both the conservative and surgical settings.

Keywords: athletic injuries; knee; anterior cruciate ligament, posterior cruciate ligament, meniscal

CPD

Knee pain presents commonly in the general practice setting.[1] More than 1 million sports related injuries occur in Australia each year; 12% of these injuries involve the knee.[2] A good understanding of the anatomy and biomechanics of the knee assists accurate diagnosis of acute knee injuries. Injuries can involve ligaments (cruciate, collateral or joint capsule), cartilage (articular or meniscal), bone (avulsion and compression fractures or bone bruising), muscle and tendon. The goal of assessment and management in acute knee injuries is to exclude fracture, manage pain, minimise knee swelling, maintain range of movement and quadriceps activation, and arrange appropriate referral.

History

A detailed history can help narrow down the nature of the injury, including:

- weight bearing – was the limb weight bearing at the time of injury?
- stress on the joint – was there a varus or valgus stress or rotational force acting through the knee at the time of injury?
- impact – was there impact with the ground or an opponent?
- sound and feeling – did the patient feel or hear a 'pop' or 'shift' in the knee? A 'pop' classically occurs with rupture of the anterior cruciate ligament (ACL). A 'shift' can occur with ACL rupture or patella dislocation
- postinjury details – a history of collapse, inability to continue play, or inability to weight bear following the injury raises suspicion of fracture or high grade ligament injury
- knee swelling – was there swelling and how quickly did this occur? An effusion developing within the first hour indicates a haemarthrosis. The source of bleeding may be from vessels in a ruptured cruciate ligament or fracture of bone within the joint capsule. In the latter scenario, a lipo-haemarthrosis can be seen on a supine lateral plain radiograph (*Figure 1*). An effusion developing more slowly or the following day is more likely to be a traumatic synovitis associated with meniscal tears and chondral pathology
- clicking, locking and instability. Painful clicking can occur with meniscal tears or chondral pathology. True locking indicates a mechanical block to extension by a displaced meniscal fragment or loose body. A meniscal tear will often cause loss of the end range of movement. A loose body can cause locking in variable degrees

Figure 1. X-ray showing lipo-haemarthrosis


Figure 2. X-ray showing fracture of the medial femoral condyle

of flexion. A knee that functions well in the anterior-posterior axis but gives way with rotational movements (often painlessly) suggests ACL deficiency. A knee that feels unstable descending stairs or walking downhill suggests posterior cruciate ligament (PCL) deficiency or patellofemoral pathology. Note that 'giving way' can also occur secondary to pain related muscle inhibition.

Examination

This can be difficult in the acute setting and may need to be repeated 3 or more days after the injury. Examination involves assessment of weight bearing, inspection, palpation for tenderness and effusion, assessment of range of movement and muscle strength, and special tests to exclude specific injury including[3]:

- ACL rupture – Lachman and pivot shift tests
- PCL injury – posterior draw test and posterior sag
- collateral ligament injury – varus and valgus stress tests
- meniscal injury – McMurray test
- patella dislocation – patella apprehension test.

Detailed description of the examination of the knee is beyond the scope of this article but can be found in the text, Clinical Sports Medicine (see *Resources*).[3]

Investigation

A plain radiograph series of the knee consists of four views: weight bearing anterior-posterior, lateral, intercondylar and patellofemoral, and is the ideal first investigation in the setting of an acute knee injury. Look for fractures of the femoral condyles (*Figure 2*), tibial plateau and avulsion injuries (*Figure 3*). In some cases a computerised tomography (CT) scan may helpful, particularly to detect occult or intra-articular fractures before surgery.

Management

Indications for splinting and urgent or prompt orthopaedic referral are shown in *Table 1*. Otherwise, management in the first 48 hours consists of rest, icing for 15 minutes, every 2 hours, compression and elevation (RICE). A compression stocking from ankle to upper thigh can help minimise soft tissue swelling and knee joint effusion. The lower limb should be elevated whenever the patient is at rest; a pillow under the knee can increase comfort and is the ideal position for performing basic quadriceps strengthening exercises. Use of splints and crutches should be limited to the initial postinjury period; prolonged immobilisation is disadvantageous. Early referral to a physiotherapist for education on range of movement and strength exercises can help optimise recovery.

ACL rupture

Exercise enthusiasts dread ACL rupture, as this injury almost always requires reconstructive surgery and 9–12 months of intensive rehabilitation before they can return to competitive sport. Rupture usually occurs when the athlete lands with heel strike through a weight bearing limb, often with a valgus or rotational force. Classically there is a sensation of a 'pop' and/or 'shifting' in the knee with immediate, severe pain. The pain eases within minutes after which the athlete may be able to weight bear, albeit gingerly. Attempts to continue activity often result in episodes of instability of the knee, especially when changing direction. Swelling develops

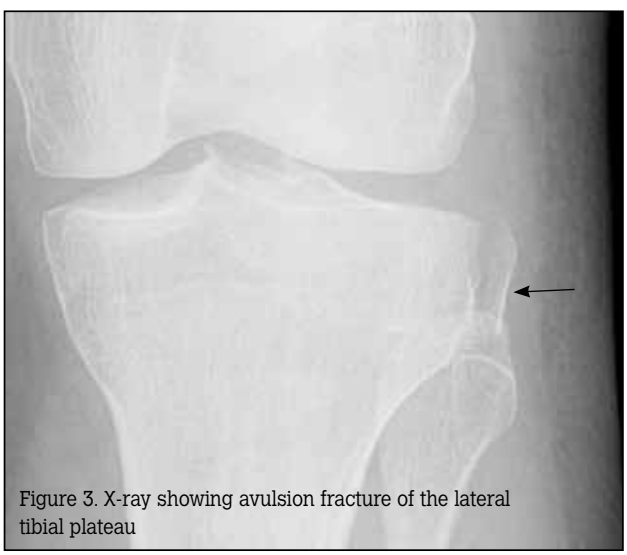
Figure 3. X-ray showing avulsion fracture of the lateral tibial plateau

rapidly, and this tense heamarthrosis can complicate examination in the acute setting. The Lachman test (*Figure 4a, b*) demonstrates laxity without a firm endpoint and has a good negative predictive value.[4] A well executed pivot shift has a good positive predictive value and should confirm the diagnosis.[5] Plain X-ray may show a fracture of the tibial plateau or avulsion of the tibial spines (*Figure 5*).

Anterior cruciate ligament rupture generally requires referral for orthopaedic assessment; patients wanting to maintain an active lifestyle will warrant surgical reconstruction. Magnetic resonance imaging (MRI) performed before orthopaedic review may expedite management and reduce the number of orthopaedic appointments required, however there is generally an out-of-pocket expense to the patient. MRI provides excellent soft tissue detail of the site of ACL rupture (*Figure 6a, b*) and associated injuries, commonly meniscal tears and bone bruising at the lateral femoral condyle and tibial plateau.

Table 1. Acute knee injuries: indications for orthopaedic referral

Urgent	• Fracture • Lipo-haemarthrosis • Neurovascular compromise
Prompt	• Locking • Intra-articular loose bodies • Painful or very large effusion • Meniscal tears • Instability • Persisting antalgic gait • ACL rupture

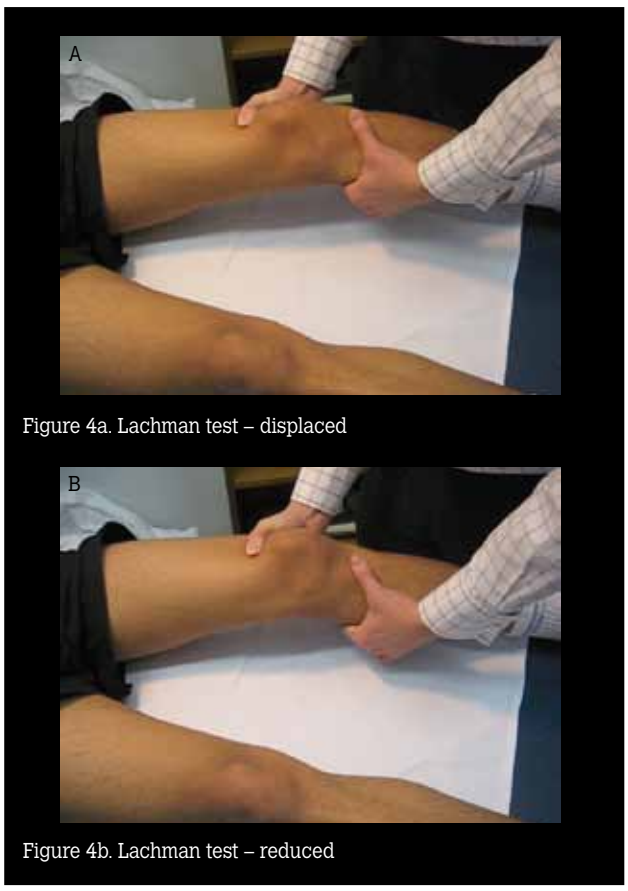

Figure 4a. Lachman test – displaced

Figure 4b. Lachman test – reduced

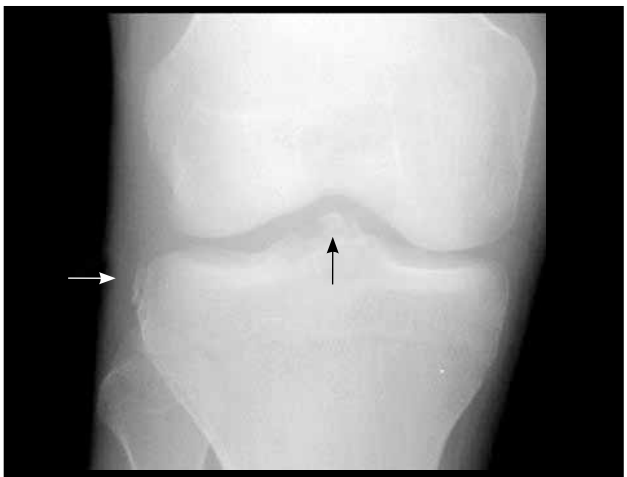
Figure 5. X-ray showing fractures of the tibial spine (black arrow) and lateral tibial plateau (white arrow)

The timing of surgery will depend on concomitant injuries and the risk of arthrofibrosis, but commonly takes place 6 weeks after injury once swelling has resolved and the patient has full movement and a pain free gait. Surgery is only the first step in management: a physiotherapy guided rehabilitation program is indicated, ideally commencing before surgery.

PCL rupture

In contrast to the ACL, which has poor blood supply and little healing capacity, the predominantly extra-capsular PCL has a good blood supply and hence better healing capacity. The classic mechanism of PCL sprain or rupture is a fall onto the knee with impact to the anterior tibia. Patients may have instability descending stairs and walking downhill, but surprisingly little other functional loss. They may demonstrate a positive posterior drawer test (sensitivity 79%, specificity 100%) and posterior sag (sensitivity 90%, specificity 99%)[6] (*Figure 7*).

A MRI will confirm PCL deficiency and exclude associated injuries: bony avulsion, lateral meniscal tears, chondral damage and injury to the postero-lateral corner structures. Isolated PCL ruptures can almost always be managed conservatively. Again, RICE principles apply. Severe injuries may require initial immobilisation in a long hinged knee brace for pain management. Optimal recovery will be achieved through a guided rehabilitation program over 6–10 weeks. General practitioners should refer all PCL ruptures to a sports physician or orthopaedic surgeon to ensure that no occult injuries are missed, that the right splint is used, and that complications of conservative management are detected early on; PCL sprains can be managed by the GP without referring on.

Figure 6a. MRI – ACL normal

Figure 6b. MRI – ACL tear

Figure 7. Posterior sag

Collateral ligament injuries

The extra-articular collateral ligaments are traditionally injured when the athlete sustains a valgus (medial collateral ligament [MCL]) or varus (lateral collateral ligament [LCL]) force through the flexed knee. The patient reports pain with or without instability in the medial or lateral knee, particularly with change of direction movements. The key examination is to apply a varus (sensitivity 25%) or valgus (sensitivity 86%) stress[7] through the knee in 30 degrees flexion and then full extension. Grade 1 injuries produce pain without laxity (<3 mm gapping at corresponding joint line.) Grade 2 injuries are often more painful, with 5–10 mm of laxity. Grade 3 injuries may be less painful as the ligament has ruptured, and this allows significant laxity (>10 mm) on testing.

Conservative management is indicated for all grades of MCL injury; grading helps to predict speed of recovery. Initially a hinged knee brace will compensate for instability by preventing varus and valgus forces through the knee. A physiotherapy guided rehabilitation program over 6–12 weeks is required. Lateral collateral ligament injuries are rare and often associated with ACL and/or PCL rupture; they should be referred for orthopaedic review.

Figure 8. MRI – meniscal tear

Meniscal injuries

Acute meniscal injuries typically occur from compression with rotational forces through the knee. The medial meniscus is restricted by its attachment to the deep fibres of the MCL and therefore is more commonly injured than the more mobile lateral meniscus. In younger patients there is often associated ligamentous injury. The patient commonly reports a 'twinge' or sudden pain over the medial or lateral joint line, with clicking, catching or locking. They may have been able to continue activity with some discomfort, and subacute onset of an effusion. Key examination findings are joint line tenderness (sensitivity 85%, specificity 29.4%) and a flexion/rotation test (McMurray test) (sensitivity 29%, specificity 95%) that reproduces pain and a 'clunk'.[8] Meniscal tears are best confirmed with MRI (*Figure 8*) and referred for orthopaedic review.

Some small tears may become asymptomatic and a trial of conservative management of small, minimally symptomatic tears over 4 weeks is acceptable.

Adults generally achieve great symptom relief from meniscal debridement at arthroscopy. Meniscal repair at arthroscopy is often successful for peripheral meniscal tears in young patients.

Patella dislocation

Traumatic patella dislocation is often associated with the sensation of something 'popping out' in the knee, severe pain, an episode of instability and a tense heamarthrosis. The patella dislocates laterally out of the trochlear groove and may reduce spontaneously. Examination reveals tenderness of the medial patella facet and medial retinaculum and a positive patella apprehension test (sensitivity 39%).[9] A plain radiograph may demonstrate a fracture. Where a traumatic loose body, large fracture or painful heamarthrosis exist, a surgical referral for arthroscopy is indicated. In all cases patients should undertake a physiotherapy program focusing on vastus medialis strengthening with the aim of preventing recurrence.

Summary of important points

- When a patient presents with a sporting knee injury, a detailed history can help narrow down the nature of the injury.
- Examination can be difficult in the acute setting and may need to be repeated 3 or more days after the injury.
- Investigation with plain radiographs and, where indicated, MRI or CT scan, will usually confirm the diagnosis.
- Initial management should follow the RICE principles and prolonged immobilisation is not recommended.
- MCL and PCL can usually be managed conservatively. Rarely, small meniscal injuries can be managed conservatively.
- Most meniscal injuries, ACL injuries and LCL injuries require surgical management.
- Physiotherapy is an integral part of the management of knee injuries in both the conservative and surgical settings.

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Author

Bianca Scotney MBBS, is a sport and exercise medicine registrar, Olympic Park Sports Medicine Centre, Melbourne, Victoria. drbscotney@opsmc.com

Conflict of interest: none declared.

Acknowledgment

I would like to acknowledge the assistance of Mr Chris Kondogiannis (orthopaedic surgeon), Mr Cameron Norsworthy (orthopaedic surgeon), and Dr Andrew Jowett (consultant sports physician) in creating this article.

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correspondence **afp@racgp.org.au**