LearnSportsMed

Knee Ligament Injuries

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Contributors

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Overview

Acute knee injuries are a common problem encountered in athletes of all age groups. A structural, practical assessment is necessary to diagnose and adequately manage knee injuries to prevent the risk of chronic instability and inadequate return to sport.

Practical knowledge of the anatomy of the ligaments of the knee is a pre-requisite to recognise these injuries. Elicitation of a focused history, awareness of mechanisms of knee injuries and a structured clinical examination will help formulate an appropriate management plan.

Case Studies

1. Mr Hopkins is a 54-year-old office worker who presented to ED after being knocked to the ground by a car reversing out of a parking spot. He complained of pain in the right knee accompanied by swelling which had been gradually worsening over the last 6 hours. He is finding it painful to walk, although he could do so unaided. On examination you note some bruising on the lateral aspect of the knee, which he informs you is where the car hit him. He is more tender to palpation in the medial aspect of his knee however and a small effusion is noted. Valgus stress test at 30-degrees of flexion was uncomfortable and revealed medial opening as compared to the contralateral knee, with no opening when the examination was repeated in full extension. X rays did not show an acute bony injury. His leg was placed in a cricket splint and he was given crutches to weight bear as able and an outpatient MRI of his knee was ordered. He was discharged with advice for RICE (rest, ice, compression, elevation), a physiotherapy referral and outpatient follow up with orthopaedics. The MRI report later showed a partial rupture of the proximal MCL with no bony injury.

2. Ms Campbell is a 26-year-old basketball player who presented to ED after hearing a pop in her right knee, having landed awkwardly during a match. She had immediate severe pain in her knee accompanied by rapid swelling and had to be aided off the court. On examination, she was holding her leg in 20-degrees of flexion, the knee was very swollen and there was generalised tenderness to palpation. She had limited range of motion in both extension and flexion and Lachman's test was positive. An X-ray of the knee was performed which was unremarkable. Her leg was put in a cricket splint and she was discharged with crutches, with an outpatient MRI and orthopaedic follow-up booked. The report showed a complete isolated rupture of the ACL. Ms Campbell underwent a course of rehabilitation with physiotherapy and was later booked for an ACL reconstruction.

Anatomy

The knee joint is a modified hinge joint. The stability of the joint is provided by 4 main ligaments:

The cruciate ligaments

- The **anterior cruciate ligament** (ACL) extends from its broad, oval tibial attachment between the inter-condylar eminences of the tibia to the postero-medial aspect of the lateral femoral condyle. The ACL is the principal restraint to anterior translation of the tibia on the femur and stabilises the knee joint against rotational forces.[1]

- The **posterior cruciate ligament** (PCL) extends from the posterior aspect of the tibial plateau to the lateral surface of the medial femoral condyle, forming an 'X' with the ACL. The PCL is the principal restraint to posterior translation of the tibia on the femur and is a secondary restraint to rotational stability of the knee.[2]

The collateral ligaments

- The medial collateral ligament (MCL) attaches from the medial epicondyle of the femur into the medial condyle of the tibia and is divided into superficial and deep fibres. The superficial MCL is the primary restraint to valgus stress.
- The lateral collateral ligament (LCL) attaches from the lateral epicondyle of the femur into the fibular head.[3] It is the primary restraint to varus stress.

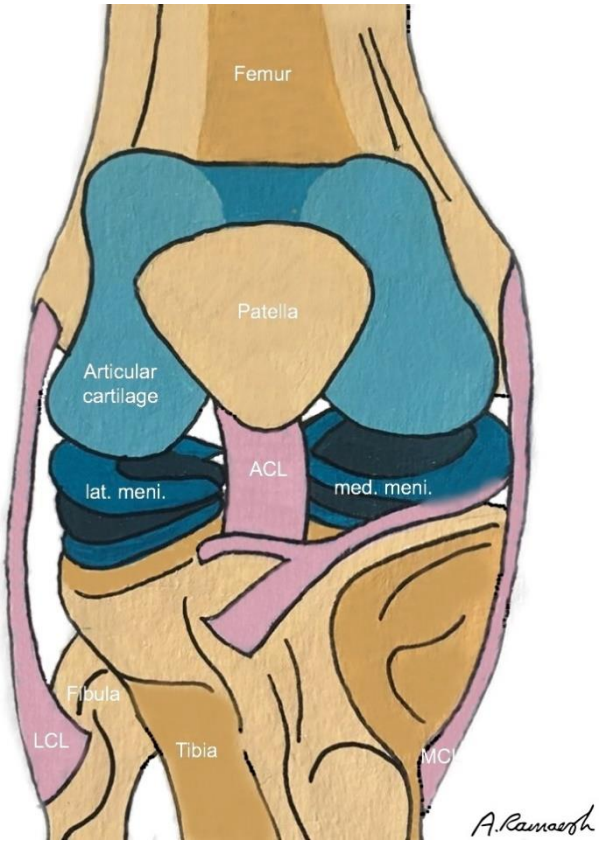

Figure one: The anatomy of the knee joint.

Aetiology

Due to varying anatomy and function, mechanism of injury differs slightly between ligaments and is an important part of the history. ACL injury can occur due to direct contact, however in 70% of cases it is a non-contact injury, classically occurring when the foot is firmly planted on the floor to allow a rapid acceleration or change in direction of the individual. As such, it is common in sports such as football and basketball. PCL injury is most likely to happen following a posterior force to the proximal third of the anterior tibia, such as a car bonnet hitting a pedestrian or a skiing injury.[4,5] The MCL and LCL are both injured following a direct force to the contralateral aspect of the knee while the joint is extended, from valgus (MCL damaged) or varus (LCL damaged) stress, or from hyperextension of the knee.[6,7]

High energy injuries may cause concurrent damage to multiple ligaments in the knee.

Clinical Features

History

Detailed history of the mechanism of injury should be taken. Cruciate ligament tears will typically be described as an audible pop or crack, followed by rapid swelling and pain, with loss of ability to ambulate.[4] Isolated collateral ligament injuries typically have milder symptoms, with a slower onset of swelling.[6]

History[7]	Significance[7]
Non-contact injury with a 'pop'	ACL Injury
Acute swelling	ACL Injury, meniscal tear
Knee gives way when weight bearing	ACL/PCL instability
Anterior force on knee or tibia, plantarflexed foot	PCL injury
Dashboard injury	PCL injury
Hyperextension + varus + tibial external rotation injury	Postero-lateral corner injury

Examination

Injury	ACL	PCL	MCL	LCL
Look	Antalgic gait or non-weight bearing. Diffusely swollen knee.	Antalgic gait. Diffusely swollen knee. **Godfrey's test (posterior sag):** Knee flexed to 90°, foot on examination couch Positive test reveals abnormal contour of tibia when viewed laterally.	Bruising with mild effusion.	Bruising with mild effusion.
Feel	Generalised tenderness of knee. Joint effusion.	Pain in posterior aspect of knee. Joint effusion.	Pain in medial aspect of knee. Joint effusion.	Pain in the lateral aspect of the joint.
Move	Inability to fully extend or flex knee joint.	Inability to fully extend or flex knee joint.	Reduced ROM, usually less severe than cruciate ligament tears.	Reduced ROM. Excessive external rotation of the knee.
Special tests (Note: All tests performed whilst supine)	**Lachman's test:** Knee flexed to 15°. Apply anterior traction to the tibia with one hand while holding the femur in place with other hand. Positive test reveals laxity of joint. Preferred test as patient may have poor flexion range of movement.	**Posterior drawer test:** Knee flexed to 90°, foot on examination couch. Positive test reveals laxity of knee joint upon application of posterior force to tibia.	**Valgus stress test:** Performed with leg at 0° and 30° flexion. Apply force to lateral aspect of knee whilst applying an abducting force to the foot on the same side.	**Varus stress test:** Performed with leg at 0° and 30° flexion. Apply force to medial aspect of knee whilst applying an adducting force to the foot on the same side.

	Anterior drawer test: Knee flexed to 90°, foot on examination couch. With both hands on the proximal tibia, attempt to translate the tibia anteriorly. Positive test reveals laxity of the joint. **Pivot shift test**: Knee extended initially. Internally rotate leg. One hand on lateral knee, the other on medial ankle. Apply valgus force as knee is flexed. Positive test elicits significant discomfort.	**Quadriceps active test:** Knee flexed to 90°, foot on examination couch. Ask patient to extend knee whilst holding it in place with counter force at ankle. Positive test reveals correction of posterior sag	Positive test reveals laxity. Laxity at 0°- MCL+/-cruciate ligament injury Laxity at 30°- MCL injury	Positive test reveals laxity. Laxity at 0°- LCL+/-cruciate ligament injury Laxity at 30°- LCL injury **Dial test**: >10° external rotation asymmetry at 30° is consistent with a posterolateral corner injury. Additional asymmetry at 90° suggests a combined PCL injury.

Note that ligament tears can present as a chronic injury rather than acute. These would present with less pain and swelling however some muscle wasting of the quadriceps and posterior compartment of thigh may be noted.[8,9]

Always compare the symptomatic knee to the unaffected side

Investigations

Plain Radiographs: These form part of any knee injury assessment to rule out associated fractures, Specific signs include- (i) Segond fracture - Avulsion of bone from the lateral tibial capsular surface attachment seen on plain radiographs suggestive of ACL injury. (ii) Avulsion fracture of fibular head suggestive of injury to the posterolateral corner.

MRI: This is the gold standard imaging for diagnosing knee ligament tears. The MRI will show what ligament is damaged, the location of the tear and its extent (partial vs complete).[8]

Management Options

Treatment options for knee ligament injury include conservative or surgical management, as with many orthopaedic pathologies.

Conservative treatment

RICE technique may be employed in the acute phase of injury. Patients will have ongoing physiotherapy for strengthening and proprioceptive exercises. Non-operative methods may have poor outcomes in young active individuals, causing some ongoing instability. Patients who lead sedentary lifestyles, however, may not notice any difference.

Surgical treatment

The gold standard for treatment of intra-articular (ACL and PCL) ligament injury is currently arthroscopic reconstruction of the ligament using an autograft, commonly the patellar, hamstring or more recently quadriceps tendon being used as a donor. Recently, arthroscopic repair of the ACL has seen renewed interest with novel techniques being described in the literature (10). The extra-articular ligaments (MCL and LCL) often require an open repair if treated surgically, although an isolated MCL injury is rarely managed operatively.

Rehabilitation

Individuals who have previously ruptured ligaments in the knee are at higher risk of knee reinjury. As such, appropriate rehabilitation is imperative. For severe ACL injuries, the return-to-play journey can include up to a year of intense rehabilitation. Ongoing physiotherapy to build the supporting musculature of the knee (quadriceps and posterior compartment of the thigh) and proprioception training is the mainstay of prevention for knee ligament injuries. Additionally, treatments such as cryotherapy and neuromuscular stimulation are becoming more popular.[11,12] Despite physiotherapy regimes however, the re-rupture rate for ACL grafts remains above 30% whether or not the patient is advised to delay return to play for a year or not, and in fact the data is currently inconclusive as to whether ACL injury prevention programs are effective for the male population.[13,14]

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