

# **SOFT TISSUE INJURIES OF THE KNEE:**

## **Primary Care and Orthopaedic Management**

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Australia has always been a nation where emphasis on health and fitness has resulted in an active population engaged in a variety of sporting and recreational activities. Not only are young people increasingly involving themselves in these activities, but the interest has also extended to the elderly population and to children. This has brought an increase in the incidence of overuse and traumatic injuries to the knee.

The primary practitioner is often burdened to not only perform an initial assessment, but also provide initial advice and initiate immediate treatment prior to possible referral to an orthopaedic surgeon. Due to the number of possible injuries to the knee, it is sometimes confusing what the initial treatment should be. The following outlines the orthopaedic management for some of the most common soft tissue injuries of the knee. I am hopeful that knowledge of the definitive treatment of these injuries will equip the primary practitioner with the understanding of the goals of the initial treatment.

### **ANATOMY**

It is vital to have knowledge of basic anatomy of the knee. The joint consists of bones, ligaments, tendons, menisci, and articular cartilage.

#### **Bones**

Three bones articulate within the knee joint proper; (1) The femur (thigh bone), (2) the tibia (shin bone), and (3) the patella (kneecap). (see Figure 1)

#### **Ligaments**

Ligaments connect bony structures to other bony structures. They act as the primary static stabilizers of the knee. There are four major ligaments supporting the joint, preventing excessive translation in four directions; (1) The anterior cruciate ligament (ACL) preventing excessive anterior translation of the tibia relative to the femur; (2) the posterior cruciate ligament (PCL) preventing excessive posterior translation of the tibia relative to the femur; (3) the medial collateral ligament (MCL) preventing excessive valgus of the knee joint; and (4) the lateral collateral ligament (LCL) preventing excessive varus of the knee joint. Many consider the lateral stability to be not only dependent on the LCL but rather on a posterolateral corner ligament complex (PLC) consisting of the lateral collateral ligament, the popliteus, the popliteofibular ligament, the biceps tendon and the iliotibial tract. The popliteus has also been known as an important secondary posterior stabilizer having a synergistic effect with the PCL. (see Figure 1)

#### **Tendons**

Tendons connect muscles to bones. While there are numerous tendons around the knee, two of the more important ones are part of the extensor mechanism. These are: (1) The quadriceps tendon, connecting the quads muscle to the kneecap; and (2) the patellar tendon, connecting the kneecap to the tibial tuberosity. Technically, the patellar tendon is a ligament as it connects two bony structures.

## **Menisci**

The menisci are bits of fibrocartilage sandwiched between the articular cartilage of the medial and lateral compartments (see Figure 2). Each knee has two menisci, the medial and the lateral. They serve several roles essential in normal knee function including load transmission, shock absorption, joint stability, lubrication and nutrition

## **Articular Cartilage**

The bones articulate with each other through the extremely smooth hyaline cartilage at the end of each bone.

## **DIAGNOSIS**

As with any medical condition, diagnosis of knee injuries depends on a complete history, a proper physical examination, and appropriate radiologic investigations.

### **Clinical History**

While many patients are uncertain of the exact mechanisms of their injuries, it is vital to attempt extracting this information during history taking. In general, ACL injuries are associated with twisting manouveres, while collateral ligament injuries are due to varus and valgus forces. A PCL injury is usually due to hyperflexion or dashboard injuries (a direct blow to the anterior tibia). Meniscal injuries are also usually due to twisting injuries while extensor mechanism injuries are due to eccentric contraction of the quads muscles while the knee was forced into flexion. History of a sudden large effusion would give the examiner an idea that a large haemarthrosis had developed, possibly due to a cruciate ligament injury. Pain distinctly on either the medial or lateral side of the knee would allude to either collateral ligament or meniscal injuries.

### **Physical Examination**

Physical examination remains to be the hallmark of diagnosis in orthopaedics. Certainly even on inspection, many conditions such as extensor mechanism injuries, collateral ligament and PCL injuries can easily be diagnosed. Detection of distinct tenderness over an anatomic structure is probably the simplest and most direct way to diagnose a knee injury. Collateral ligament, meniscal and chondral injuries are most readily diagnosed by identifying distinct tenderness over these structures. Detection of a large effusion is typically due to a cruciate ligament injury, a patellar dislocation or a chondral injury. Typically, collateral ligament injuries do not cause a large effusion. Cruciate ligament injury can only be diagnosed through special manouveres such as a Lachman's test and a pivot shift test for the ACL and a posterior drawer and reverse pivot shift for the PCL. Meniscal provocation to me is not a very specific test. Patellar provocation is also not as helpful for acute knee injuries.

### **Investigations**

The most appropriate initial radiographic investigation is a plane radiograph. While only a few soft tissue injuries can be identified through plane radiographs, these tests will clearly rule out any bony injuries. Telltale avulsion fractures around the knee are pathognomonic for some injuries including that of the ACL and MCL. An example is the Segond fracture, a flake of bone seen at the edge of the lateral tibial plateau, indicative of an ACL rupture (see Figure 3). A large joint effusion also gives you an idea of a significant internal derangement.

An ultrasound either has no role or has very little role in the diagnosis of knee conditions. I do not think this is a worthwhile investigation for this joint, except in specific cases where hard physical examination findings have provided a diagnosis and an ultrasound is merely used as a confirmatory test.

CT scans are superior to x-rays for assessment of bony injuries while an MRI is the gold standard in our local settings. The primary practitioner usually arranges for a specialist consultation and leaves the Orthopaedic Surgeon to request for the MRI to decrease the costs for the patient.

## **ORTHOPAEDIC MANAGEMENT AND PRIMARY CARE**

The following outlines the most usual orthopaedic management of some of the most common soft tissue injuries of the knee. I will touch also on the timing of the definitive management in the hope of giving the primary practitioner an idea of the appropriate treatment after initial evaluation.

### **Anterior Cruciate Ligament Injury**

The definitive treatment for instability due to an anterior cruciate ligament injury is an ACL reconstruction. It must be noted that the ACL is not “repaired”, which refers to the repositioning of the ends of a torn ligament and suturing them back together. Rather, this ligament is “reconstructed”, which refers to the replacement of the ruptured ligament, usually with a tendon harvested from the patient, referred to as an autograft (see Figure 4). **Not all patients with deficient ACL’s will require an operation.** In general, only active individuals that are prone to repeated subluxation of the knee will require surgery. Otherwise, proper counseling on maneuvers that must be avoided to prevent subluxation would suffice if the patient engages in mainly sedentary activities. It is generally believed that the ACL reconstruction is best delayed until the swelling has gone down and the range of motion of the knee is back to normal. This may take at least 4-6 weeks to occur. The early management of ACL injuries includes measures to control pain and swelling. These must include icing, compression, and pain relief medications. Early resumption of weight bearing and muscle activation must be encouraged. Range of motion exercises must proceed as tolerated. It is essential however to confirm that no other injuries contraindicate these early treatment modalities. If in doubt, the knee can be immobilised and weight bearing can be restricted, but a definite diagnosis must be established at the soonest time. This will allow appropriate mobilization at the earliest time if it is not contraindicated.

### **Posterior Cruciate Ligament Injury**

It is rare for the posterior cruciate ligament to be injured in isolation. In many instances, this injury is associated with injuries to other ligaments. Nonetheless, an isolated PCL tear usually requires no surgery. Certain discomfort may be experienced by the patient in the long term, especially while walking on declines and when walking down stairs. Some high level athletes may also require a PCL reconstruction. Non-surgical management emphasizes on quad strengthening and early avoidance of hamstring exercises. Upon diagnosis of an isolated PCL tear, the early goal would be similar to the initial treatment of ACL tears. The patient must be counseled and informed of the reason why non-surgical management is being undertaken.

### **Medial Collateral Ligament Injury**

The MCL is one of the most commonly injured ligaments in the knee. This is caused by a laterally applied valgus producing force. An isolated MCL tear is by far mostly treated non-operatively. Upon diagnosis of an isolated MCL tear, arrangements must be made for a hinged knee brace such that the patient can be allowed full weight bearing and range of motion exercises as tolerated within the brace. **Even in cases of high grade tears, surgical management is usually unnecessary.** Therefore, as long as the diagnosis is certainly isolated, a specialist referral is mostly unnecessary. Again, modalities to control pain and facilitate reduction of swelling and range of motion are of priority.

### **Posterolateral Corner Ligament Complex Injury**

Injury to the PLC typically involves hyperextension with a varus moment and twisting force. The complex is hardly ever injured in isolation and is usually associated with a multiligamentous injury. Nonetheless, unlike most ligaments around the knee, a PLC injury **requires acute repair** and is therefore best diagnosed early. **Acute referral to a specialist at the earliest time is therefore recommended** if this injury is suspected. Nonetheless, irreparable structures and chronic cases may be amenable to reconstruction with results that may be inferior to early repair. Therefore, any sign of a PLC injury such as tenderness over the posterolateral corner, a varus thrust or a positive Dial test should alert the primary practitioner to facilitate early diagnosis and treatment. Immobilisation of the knee is important after initial evaluation.

### **Meniscal Injury**

Meniscal injuries are one of the most common injuries in the knee. Depending on the configuration and size of the tear, in most instances early mobilisation and weight bearing may be allowed unless the patient cannot tolerate this. **Management is mostly surgical** as even small tears can sometimes propagate to form larger tears if left untreated. Certainly, many configurations do not require any surgical treatment but this judgment is best left in the hands of the Orthopaedic Surgeon. Therefore specialist review is ideal in for patients with these injuries.

### **Patellar Dislocation**

A patient may be seen with their patella still dislocated, or may be seen after spontaneous reduction after dislocation. If the patella is still dislocated, the early management consists of reduction of the patella at the soonest time. This may be performed by a primary practitioner who has had past experiences with this injury. Otherwise, referral to an emergency department is most prudent. If seen with the patella reduced, the goal of initial treatment is immobilisation with a knee brace and aggressive modalities to reduce pain and swelling. I think that a **routine specialist opinion must be obtained and further imaging with an MRI should be routinely undertaken** to rule out the possibility of a chondral injury, which may cause further damage to the knee during weight bearing and range of motion. Counseling on the incidence of recurrent dislocation must be provided depending on the patient's age group. In general, incidents of instability decrease with age. In the absence of any chondral injury, the management mainly consists of knee immobilisation for 4-6 weeks followed by range of motion and strengthening exercises. Recurrent patellar dislocation will require one of the many possible methods of stabilisation including a medial patellofemoral ligament (MPFL) reconstruction, a tibial tuberosity transfer, a lateral release and a medial plication. Various combinations of these procedures may be utilised by the operating surgeon.

### **Extensor Mechanism Injury**

Quadriceps tendon ruptures common in the elderly, and patellar tendon injuries common in young active patients must be treated acutely. Upon diagnosis, **the knee must be kept in extension with an immobiliser**. Modalities to prevent pain and swelling must be undertaken. Early referral to an emergency department or a specialist Orthopaedic Surgeon must be facilitated. Orthopaedic management involves early repair of the ruptured structures.

### **Chondral Injury**

Chondral injuries are difficult to diagnose both clinically and radiologically. Improvements with MRI techniques have made diagnosis of these injuries much easier. Depending on the size of the chondral injury, surgical management may be required. While I think that patients with chondral injuries may be allowed to mobilise as tolerated, the patient must also be advised to refrain from further activity if he or she experiences clicking or locking due to the loose body within the knee joint. In these cases, immobilisation and early specialist referral must be undertaken.

### **SUMMARY OF EARLY TREATMENT**

The early management of the primary care practitioner should depend on the type of injury and the certainty of the diagnosis. When in doubt, the knee is best immobilised, iced and modalities to reduce pain and swelling must be undertaken. Weight bearing precautions may also be implemented. In these cases however, early specialist referral must be facilitated, as **the patient must not be allowed to be immobilised for prolonged periods of time without a definite diagnosis**. In cases where the diagnosis has been clearly established, the recommendation given above should apply. Without adequate experience with these injuries, it is reasonable for one to be confused of the most appropriate early management. In these cases, a quick call to your favourite Orthopaedic Surgeon would most usually address any dilemma.