

## **Marathon Running & Knee Injuries**

### **Mr Sanjiv Jari**

**Consultant Knee, Lower Limb & Orthopaedic Sports Medicine Surgeon**

**Honorary Clinical Lecturer, University of Manchester.**

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At first sight it may not be evident that knee problems are common in people undertaking long distance running. The main reason for the knee problems is due to the repetitive loading that the knee joints will get from the impact of landing with each step whilst running. This usually results in chronic knee problems which are more common in long distance runners than acute knee conditions.

Acute knee injuries can also occur but are not something unique to distance running. These can occur for example, if whilst running the runner inadvertently steps into a pot hole or trips, resulting in a twisting injury to the knee and a fall, which can result in various conditions including meniscus tears, ligament tears, including anterior cruciate ligament tears, knee cap dislocations and various soft tissue bruising injuries. However, acute knee injuries are not unduly common in long distance running.

The main stay of knee and leg problems is related to chronic overuse. The conditions affecting the knee and leg can be broken down into soft tissue problems such as tendonitis and meniscal injuries and bony problems such as shin splints and stress fractures.

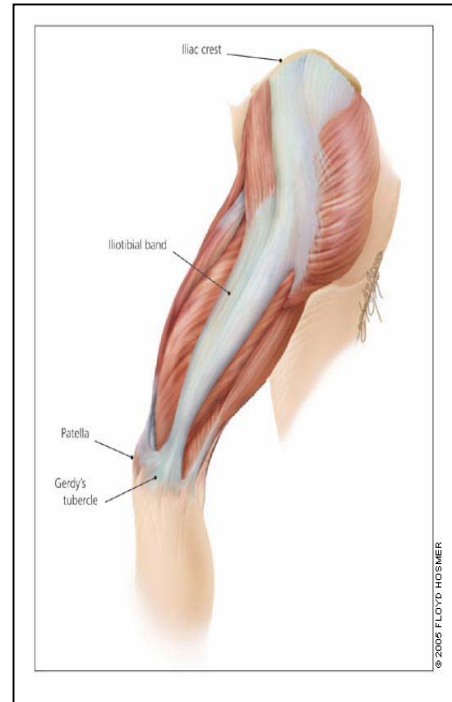
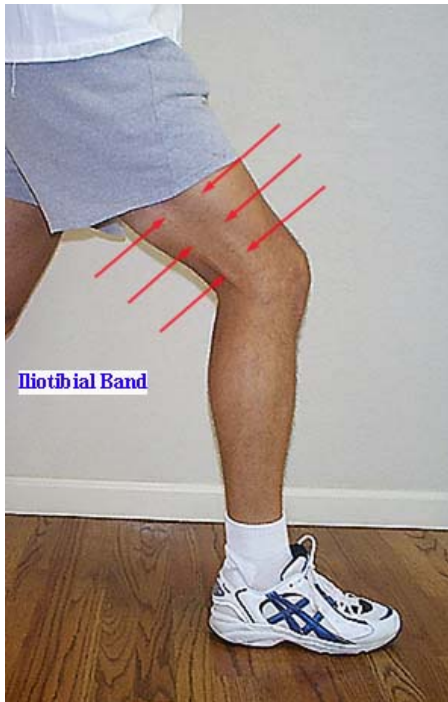
One of the important causes of knee and leg problems in long distance runners is more of a concern in recreational runners who decide that they are going to compete in long distance events such as marathons. They suddenly increase their running distance, resulting in an acute-on-chronic overload which their muscles and bones are not able to withstand, resulting in tendonitis and stress fractures. The golden rule in terms of distance increase is that the distance should not be increased more than 10% per week and therefore it should be a gradual progressive increase which will allow the muscles and bones to adapt to the loading.

### **Soft Tissue Injuries**

Tendonitis commonly occurs in long distance runners and is due to a combination of overloading as well as lack of stretching, resulting in tightness and therefore irritation of the tendons. The commonest tendonitis in long distance runners is ilio-tibial band tendonitis.

#### **Ilio-tibial band (ITB) tendonitis**

The ilio-tibial band is a large, thick structure which runs down the outside of the leg and inserts on the top of the shin bone.



The cause of knee pain in ITB tendonitis is due to “overload” or “biomechanical errors”. Overload is common with sports that require a lot of running or weight bearing activity. This is why ITB is commonly a runner's injury. When the tensor fasciae latae muscle and iliotibial band become fatigued and overloaded, they lose their ability to adequately stabilize the entire leg. This in-turn places stress on the knee joint, which results in pain and damage to the structures that make up the knee joint.

**Overload on the ITB can be caused by a number of things. They include:**

- exercising on hard surfaces, like concrete;
- exercising on uneven ground;
- beginning an exercise program after a long lay-off period;
- Increasing exercise intensity or duration too quickly;
- Exercising in worn out or ill fitting shoes; and
- Excessive uphill or downhill running.

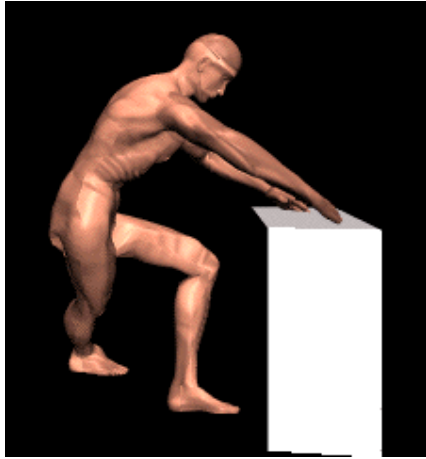
**Biomechanical errors include:**

- Leg length differences;
- Tight, stiff muscles in the leg;
- Muscle imbalances;
- Gait or running style problems such as over-pronation (flat feet).

The main stay of treating this condition is to correct and biomechanical problems Such as using in-soles for over pronation of the feet) and reduce overloading. However, once it has developed, the treatment would consist of

initially various physiotherapy modalities including ultrasound and laser as well as stretching the muscles and tendons before and after exercise.

## ILIOTIBIAL BAND STRETCH



### Side View.

1. Place the right leg behind the left.
2. Bend at the waist, leaning over a support, such as a desk or counter.
3. As you bend the left knee, slide the right leg out away from your body. Keep the right knee straight.
4. Bend your body toward the right leg.

You should feel a stretch along the outside of the right thigh.



### Front View.

The "desk" has been removed to better demonstrate the stretch.

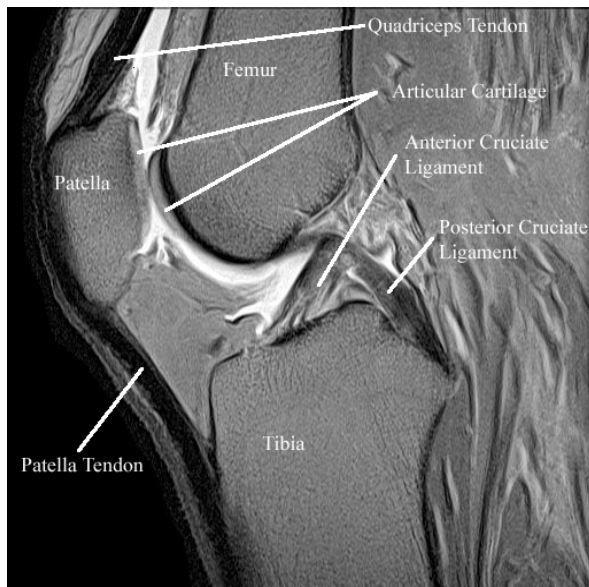
If you lean your upper body towards the leg you are stretching, then this will better stretch the IT band. In the example, the figure would bend (at the waist) to the right side of the screen. (the figure's left hand side)

Shockwave therapy (Lithotripsy) can also be used for tendonopathy. Occasionally a steroid injection can be injected around the tendon but not into the tendon as an intra-tendonous injection can lead to a rupture of the tendon. The steroid will act as an anti-inflammatory and can allow the symptoms to settle. Another option would be to undertake a course of Aprotinin injections. These injections act by blocking the effect of an enzyme which causes tendon breakdown and can certainly lead to an improvement in the symptoms.

Whilst the treatments are being undertaken, it is important to try and maintain cardiovascular fitness and this can be done using an upper body weights programme as well as non-impact loading exercise such as biking, cross trainer or swimming. The important aspect is to avoid impact loading as each time the foot impacts the ground, this is when the IT band tightens and then leads to symptom development.

As with any tendonitis type condition, it is important that if the symptoms of pain develop, that the exercise is stopped immediately as any continuation of the exercise will lead to further damage within the tendon. This is not the type of condition where it is advisable to run through the pain.

### Patella Tendonitis

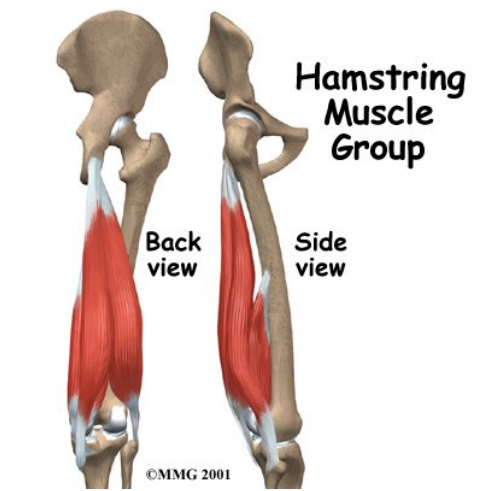


This is more common in athletes involved in explosive sports that involve a lot of jumping but can occasionally occur in runners. Occasionally it can be triggered by a fall onto the front of the knee, where the kneecap tendon becomes inflamed but more usually it is a chronic overuse tendonitis resulting in pain specifically at the front of the knee at the bottom end of the kneecap bone.

The treatment progresses along the same principals as ilio-tibial band tendonitis, with stretching of the quadiceps muscles and the hamstrings. In addition, a specific type of strengthening programme called an Eccentric strengthening programme is also undertaken under the supervision of physiotherapists, which aims to increase muscle strength without excessively loading the tendon. Ultrasound and laser can also be used, as can friction massages, which can be demonstrated by the physiotherapists. Shockwave therapy and Aprotinin injections are further options.

The final option in managing a tendonitis which is resistant to treatment is surgery, which would involve decompressing the tendon and removing the inflamed part. Following this there would be a structured rehabilitation, conditioning and strengthening programme.

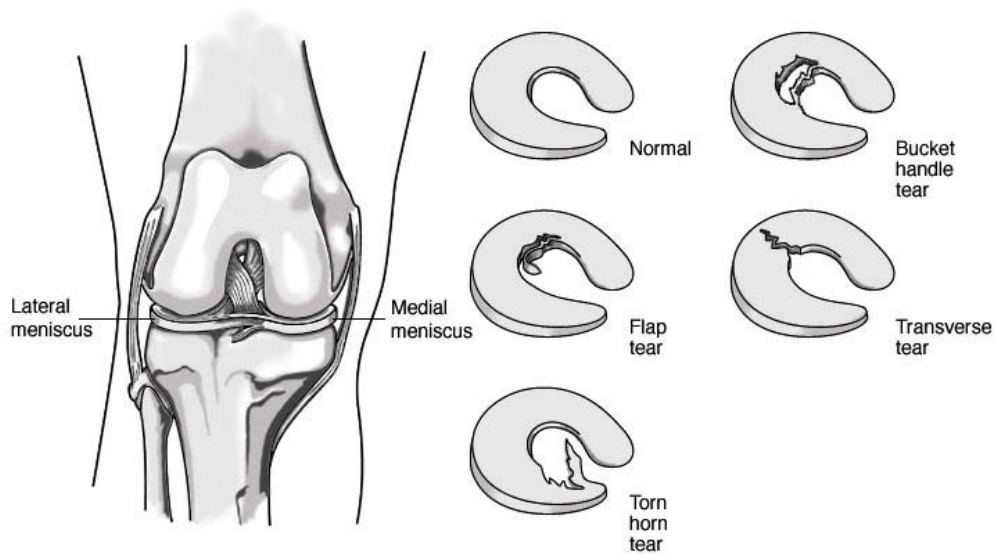
### Hamstring Tendonitis



This condition is more common in sprinters than it is in long distance runners. It can cause pain anywhere along the course of the hamstring tendons but most commonly occurs on the inner aspect of the shin bone towards the knee joint or around the back of the knee. The tendon can be thickened as well as inflamed.

The treatment progresses along the same principals as that of patella tendonitis. Surgery is not commonly indicated for hamstring tendonitis as it usually resolves with conservative treatment.

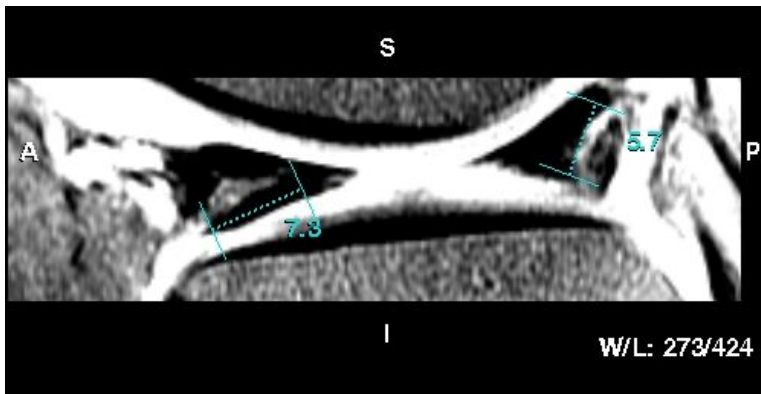
## Meniscal Injuries



Menisci are shock absorbers within the knee and are composed of two pieces of gristle within the knee joint, one in the inner compartment (medial meniscus) and one in the outer compartment (lateral meniscus). These act to spread out loading forces into the knee. As people get older, the menisci get stiffer and are less apt at spreading forces and more likely to tear. The common cause of tearing these is twisting injuries but they can occur with repetitive impact loading.

The symptoms of meniscus tear are usually pain localised to the inner or outer aspect of the knee. Occasionally the patients will complain of clicking or catching of the knee. They may complain of locking. The condition is usually associated with swelling within the knee joint. This is also then combined with wasting of the thigh muscles.

The diagnosis is made by the clinical examination, aided by investigations such as an *MRI scan* [link: <http://www.thekneedoc.co.uk/content.asp?section=5&parentID=1&article=38> ] of the knee.



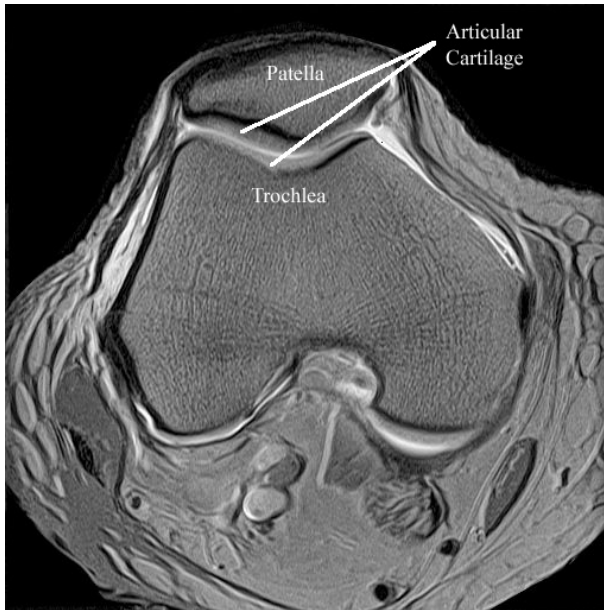
MRI scan showing tears (grey areas) in the menisci (black triangles)

anti-inflammatories, as well as physiotherapy modalities with the aim of trying to reduce swelling and increasing motion.

Ultimately once the condition is diagnosed, the optimal treatment is usually surgery involving an *arthroscopy* (*keyhole surgery*) [link: <http://www.thekneedoc.co.uk/content.asp?section=18&parentID=1&article=52>] to go into the knee joint and deal with the meniscus tear. Most degenerative meniscus tears are not repairable and the torn piece, which is no longer performing its normal function, is simply removed. Any normal cartilage is left in place.

Following the surgery the aim is to reduce the swelling as quickly as possible and regain motion in the *knee* [link: <http://www.thekneedoc.co.uk/content.asp?section=19&parentID=1>]. This is accomplished using a compression stocking, *Cryocuff* [link: <http://www.thekneedoc.co.uk/content.asp?section=19&parentID=1&article=71>] and taking anti-inflammatories. Physiotherapy would commence a week following the surgery, with the aims of minimising swelling, regaining motion and then progressing to a strengthening and conditioning programme. As basic strengthening and conditioning increases the aim is then to commence on a sports specific rehabilitation programme to get people back to the activities they want to do.

## Chondral injuries (lining cartilage of the knee)



The final common problem that runners may experience is damage to the lining surface of the knee (articular cartilage). The articular cartilage of the knee is a smooth layer which lines the bone and provides a low friction surface for the surfaces of the joint to move against. When this lining cartilage thins and disappears, as occurs as a normal part of ageing, this is called *arthritis* [link: <http://www.thekneedoc.co.uk/content.asp?section=16&parentID=1&article=67>]

The articular cartilage is designed to withstand a certain amount of force. Activities that involve jumping, running and twisting can cause a chronic overloading to the articular cartilage which can ultimately lead to its breakdown. This will lead to in essence, the accelerated development of degenerative changes within the knee joint and can be seen clinically in the knee as a localised area of cartilage loss or the earlier onset of an arthritis.

It is well known that many athletes who overload their joints can develop earlier onset of degenerative changes and this can include runners as well as footballers, basketball players and so forth.

The clinical symptoms from damage to the articular cartilage can mimic meniscus tears, with people presenting with localised pain in the knee, swelling, muscle wasting, catching and locking in the knee if a loose piece of lining cartilage had been knocked off and is loose within the joint. The diagnosis of damage to the lining surface of the joint is usually made on a combination of X-rays and MRI scans.

The treatment initially is the same as for meniscus tears, involving physiotherapy modalities, rest, ice, elevation, compression and non-steroid anti-inflammatory drugs.



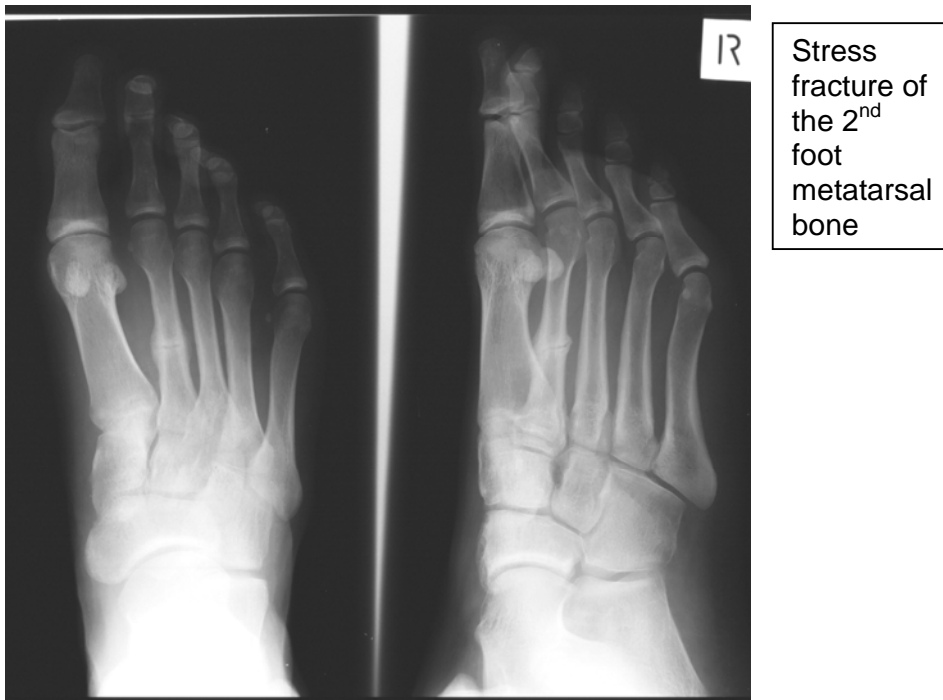
Occasionally steroid injections can be injected into the joint to try and reduce inflammation and therefore control swelling and pain but this is usually only a temporising measure and the symptoms may recur.

A better option is to use injections of *Hyaluronic acid* [link: <http://www.thekneedoc.co.uk/content.asp?section=20&parentID=1&article=88> ], which is a normal constituent of the fluid within the knee joint and has various beneficial effects which will increase the shock absorbing capacity of the joint and allow the cartilage to function somewhat more normally. It does not reverse the damage to the joint as it is already present.

Failing these treatments, the next option is surgical, which would initially involve keyhole surgery to clean up any lining cartilage damage, following which there are various options of surgical treatment which can be undertaken. For more information regarding these go to <http://www.thekneedoc.co.uk/content.asp?section=16&parentID=1&article=77>

## **Bony injuries**

### **Stress Fractures**



Stress fractures are a chronic overloading condition of the bone. They can occur in a number of bones of the leg, including the feet (metatarsal stress fracture), around the ankle joint, and the most serious is the shin bone stress fracture (tibial stress fracture). Tibial stress fractures are one extreme of a continuum of conditions which merge in with a condition commonly known as shin splints. The person commonly develops gradually increasing pain felt along the shin bone which increases during weight bearing impact exercise.

As the condition increases in severity, the pain can become more intrusive and occur earlier in the exercise phase and eventually can occur at rest.

Stress fractures can occasionally complete to become complete fractures.

The treatment for stress fractures initially progresses along the lines of rest, ice, elevation and taking anti-inflammatory medication. The affected bone is usually immobilised in either a plaster cast or a removable boot. A bone stimulator can also be used to increase the healing response.

A stress fracture occurs because the chronic overuse and loading of the bone becomes to such an extent that it overcomes the bones ongoing healing response, resulting in initially microscopic fractures which then join together to form a more obvious fracture. Because this occurs as a chronic condition, the body's response to the fracture is to try and get it to heal and so the healing response co-exists with the forces causing the breakdown from the overloading. The aim of the immobilisation and rest is to allow the healing forces to increase and reduce the forces producing the fracture so as to cause the fracture to heal. Stress fractures do have a higher rate of not healing and should they not heal with initially conservative treatment, they would require surgery.

Stress fractures can be diagnosed on plain X-rays, MRI scans or *three phase bone scans* [link: <http://www.thekneedoc.co.uk/content.asp?section=5&parentID=1&article=42>].

Once the diagnosis is made and the initial period of rest and immobilisation has passed, which will vary depending on the bone that is injured, the next phase is a strengthening and conditioning programme to maintain cardiovascular fitness whilst avoiding impact loading. This can be done using a bike, cross trainer or in the swimming pool. It is also possible to undertake activities such as biking in the boot, depending upon the severity of the fracture and the surgeon's clinical judgement.

If the fractures do not heal and the symptoms do not settle down then usually surgical treatment is indicated to fix the fractures with various metal implants, depending upon the bone involved.

## **Summary**

In conclusion long distance runners can sustain a number of injuries to the knee and leg, most of which are chronic overloading conditions. The first line of treatment for most of these is a combination of rest, ice, elevation, compression and anti-inflammatories, along with physiotherapy. Should these not help, it is then sensible to seek further advice from a sports physician or an orthopaedic surgeon.

It is important to try and minimise any potential for damage by taking precautions to try and minimise the overloading of the knee and leg. This would include:

- Ensuring that distance increase is no more than 10% per week.
- Making sure you have a good pair of well fitting trainers which are less than six months old as the shock absorbing capacity of trainers diminishes after six months and therefore should be changed every six months.
- Ensuring that you have a good baseline level of strengthening conditioning.
- Undertaking a good stretching programme before and after exercise.
- Ensuring that you have a well balanced nutritional diet, including regular intakes of protein which are the building blocks for muscle and cartilage.

For more information about specific knee problems, please go to [www.thekneedoc.co.uk](http://www.thekneedoc.co.uk)