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Mike Paterson, APA Sports and Musculoskeletal Physiotherapist, examines the second most common knee injury facing runners—iliotibial band injuries.

A pain in the knee: ITB injuries

Following patella-femoral syndrome, iliotibial band (ITB) problems in runners are considered the next most common knee injury. Its prevalence in the literature varies from 2 to 15 per cent of all runners, and it is seen more in endurance runners and triathletes.

Symptoms of ITB present as pain over the lateral epicondyle of the femur. Pain generally worsens with repetition and continued loading/exercise. Often seen with a rapid increase in training load, it can affect a wide breadth of runners, from experienced runners down to your weekend plodder. Injuries of the ITB are more commonly seen in road runners than trail runners, though the latter are not immune. The ITB can be challenging to treat as symptoms often coincide with increases in training load, prior to an event. ITB injuries were historically described as a friction injury due to the worsening symptoms with repetition.

ITB anatomy

Anatomical studies refute the idea of a friction syndrome injury. If we look at a brief anatomy of the ITB, it has proximal origins in the tensor fascia lata (TFL), gluteus maximus (GMx) and medius (GMe) muscles and the iliac crest. It then attaches down the lateral intermuscular septum to almost the full length of the femur, and distally has two main attachments: Gerdy's tubercle (on the lateral tibia) and the lateral epicondyle of the femur. Distally, it has secondary attachments into the patellar retinaculum, head of fibula, patellar tendon, biceps femoris and vastus lateralis. Mild symptoms can be observed in these areas in early stages of injury. Symptoms in the areas of the secondary attachments seem to cause niggles and areas of tightness and pain, which are often more transient but can be a precursor to worsening symptoms.

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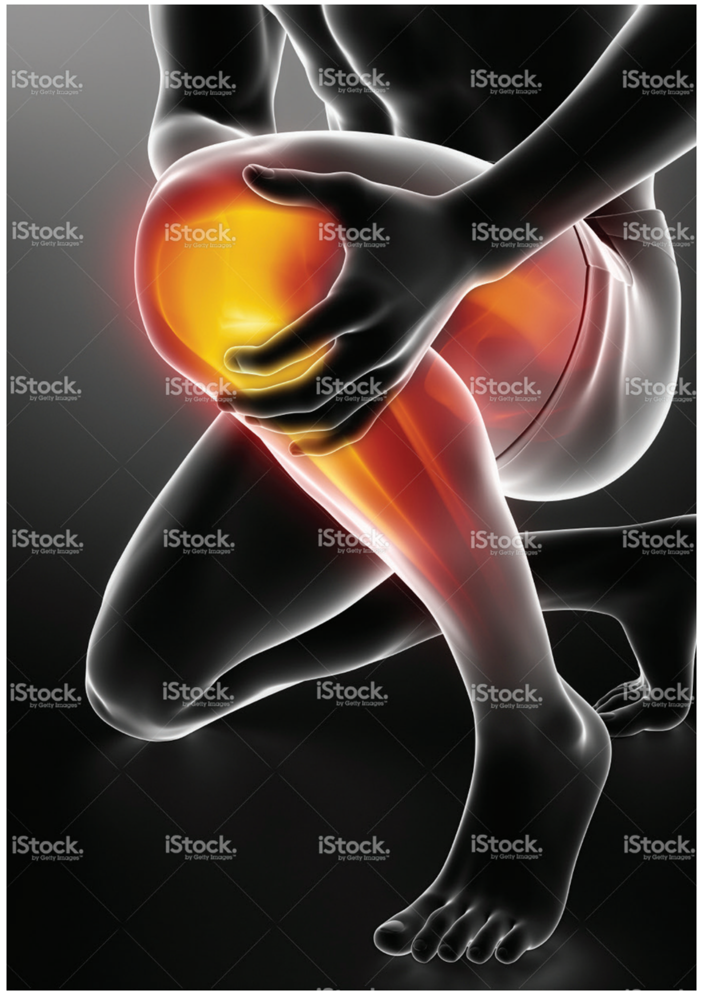

Studies show the lateral epicondyle attachment is through the femoral periosteum, with fibres organised similarly to a tendon. Histologically, the area is consistent with a tendon, with a layer of adipose tissue underneath ITB attachment area, and no bursa present. This adipose tissue is highly vascular, containing Pacinian corpuscles (mechanoreceptors responsible for vibration and pressure). This suggests that compression of fat pad and Pacinian corpuscles causing inflammation to this vascular area is the most likely source of pain in the ITB. Anatomically, this suggests the ITB has a proximal tendinous (femoral epicondyle) and distal ligamentous (femoral epicondyle to Gerdy's tubercle) role.

ITB function

The function of the ITB is not well defined. While primates, bears and multiple other four-legged animals have all exhibited TFL, GMx and GMe musculature in dissection studies, none have exhibited an ITB. This suggests the ITB is possibly an independent stabiliser of the lateral knee joint, essential for mobility in an erect posture. The ITB has been shown to be capable of storing and releasing elastic energy during running. Modelling showed in running speeds of 2–5 m/s (7.2–18 km/h) that the ITB stores one joule (J) of energy per stride in slow running and seven J during fast running. Seven J represents 14 per cent of the energy stored in the Achilles tendon at a comparable running speed. A case study of a Navy Seal described an isolated rupture of the ITB following three cortisone injections two months apart. Following the ITB rupture, the knee lacked lateral stability and began to damage the anterior cruciate ligament on follow-up MRI. Following repair to the ITB, the patient was able to rehabilitate and return to full active duty.

Pelvic stability has been described as being reliant on the control of the ITB tensioners and the trochanteric abductors. ITB tensioners are TFL, vastus lateralis (VL) and upper GMx; trochanteric abductors are GMe and gluteus minimus. ITB tensioners produce 30 per cent of force required in single leg stance, while 70 per cent is produced by trochanteric abductors. ITB tensioners are integral, as GMe is insufficient to produce enough force to resist hip adduction in single leg weight-bearing. Weakness and/or atrophy of trochanteric abductors may result in higher contribution from ITB tensioners and/or an increase in hip adduction. Think of runners and cyclists with huge VL, but poor glutes and pelvic control. Are they trying to use VL to inflate the ITB to generate pelvis stability?

ITB injury mechanisms

While there is a paucity of quality evidence, overwhelmingly in the literature, increased hip adduction appears as a contributing factor in ITB pain. The cause of this hip adduction appears varied, demonstrating the true biomechanical nature and challenge in treating the injury.

Studies show symptomatic runners with ITB demonstrate one or more of the following features when compared with asymptomatic controls:

- greater hip adduction angle (Trendelenburg)
- greater knee internal rotation (compensated Trendelenburg)
- increased foot/rearfoot inversion
- higher knee flexion at heel strike
    - narrower step width
    - weaker hip abductors and/or external rotators

Running on a camber has also been known to cause ITB injuries and has even been termed 'ditch foot' as it presents on the downhill (ditch) leg. This makes sense if you are considering hip adduction moments and, therefore, a leg length discrepancy should also be assessed, with symptoms likely to present on the longer leg.

Physiotherapists therefore need to assess the entire lower limb kinetic chain (possibly in a fatigued state) to formulate a successful rehabilitation for their patient. GMe strength is important in controlling hip adduction and weakness and fatigue are often the main contributing factors in ITB pain. If a runner's mechanics are also contributing, strengthening alone often is not enough. Patient education on step width, stride length and cadence can all assist in decreasing glute load, assisting with better hip control of adduction in stance phase.

Stretching of the ITB (if possible) seems to have little benefit. Cadaver studies on ITB lengthening have often been of poor quality and have not accounted for movement from proximal muscles. The popular practice of ITB rolling is also questionable, if we begin to think of the ITB as a lateral stabiliser/tendinous structure. However, the idea of VL being a tensioner suggests VL rolling and stretching may have merit.

Load management is also another area of rehabilitation of the ITB that needs consideration, when the physiotherapist is formulating a rehabilitation plan for the patient.

Conclusion

If treating a runner with ITB pain, think of a dynamic assessment with a broad multifactorial treatment approach. Try keeping these questions in the back of your mind:

- does the ITB increase efficiency of GMe to stabilise knee and pelvis in gait, especially running?
- is it an aponeurosis to improve the leverage arm for pelvic control?
- could the ITB be the longest tendon in the body?
- is ITB lateral knee pain from compression of Pacinian corpuscles causing inflammation or a tendon enthesopathy? Or could it be a bit of both?

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Mike Paterson is an APA Sports and Musculoskeletal Physiotherapist. Mike has worked and travelled with representative Rugby Union teams in New Zealand and Australia, state-level touch squads, and many other athletes. Mike is a passionate trail runner and has competed in numerous off-road and multisport races as well as three ultramarathons.