ILIOTIBIAL BAND FRICTION SYNDROME REHABILITATION

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INTRODUCTION

Iliotibial band syndrome (ITBS) is a common cause of both lateral knee pain and lateral hip pain in sport. In running the incidence can be as high as 12% (1), and the condition is also seen in cyclists (2). ITBS over the knee occurs when the tight ITB repeatedly rubs over the lateral femoral epicondyle, and the bursa covering it (Figs.1a+1b), causing friction and tissue irritation. The condition here is often described as 'runners knee'. The ITB has been shown to thicken from an average of 2.5mm to 5.5mm at the knee, and to develop fluid beneath itself (3). Over the hip, ITBS occurs when the band rubs across the greater trochanter. In this case the condition represents external 'snapping' hip (coxa saltans) and may give rise to irritation or trochanteric bursitis. Internal snapping hip is a separate condition affecting the iliopsoas tendon.

Although common in athletes, both conditions may also occur in the general population. ITBS at the hip is a common cause of hip pain in middle age, with pain presenting at night when lying on the unaffected side. This position (adduction and medial rotation of the affected upper hip) places a stretch over the ITB and lengthens the posterior portion of the gluteus medius muscle. Pain is also often noticed with functional squatting actions (hip flexion) such as sitting down into a low chair.

ITBS is often paralleled by an altered muscle balance in the lower limb (4,5). The most common imbalance presenting as lengthening of the gluteus medius muscle and tightening of the iliotibial band and tensor fascia lata muscle (ITB-TFL, see below).

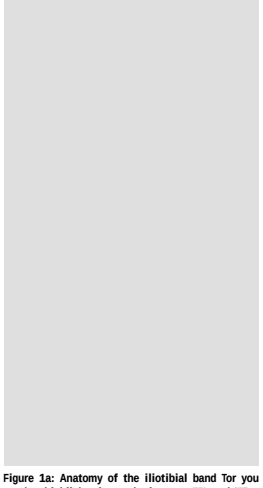


Figure 1a: Anatomy of the iliotibial band Tor you need to highlight glut med, glut max, TFL and ITB

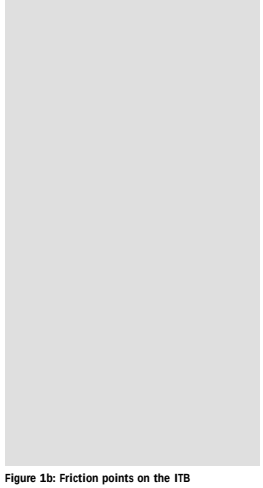


Figure 1b: Friction points on the ITB

STRUCTURE

The deep fascia of the lower limb is collectively called the fascia lata. It attaches to the outer lip of the iliac crest between the anterior superior iliac spine (ASIS) and the posterior superior iliac spine (PSIS). In addition it throws branches to the sacrotuberous ligament, the ischial tuberosity, and the pubis, effectively surrounding the upper thigh. On the lateral aspect of the thigh, the fascia is thickened into two distinct layers forming a non-elastic collagen cord, the ITB.

The gluteus maximus and gluteus medius muscles both insert into the ITB posteriorly. The TFL inserts anteriorly, with contractile fibres travelling one third of the way down the band.

As the ITB travels down the lateral side of the thigh its deep fibres form inwardly directed sheets attaching to the linea aspera of the femur. These are the medial and lateral intermuscular septa. The superficial fibres of the ITB continue downwards to attach to the lateral femoral condyle, lateral patellar retinaculum and anterolateral aspect of the tibial condyle (Gerdy's tubercle). A large amount of the lateral retinaculum of the patella actually arises from the ITB to form the iliopatellar band (6) having a direct effect on patellar tracking.

BIOMECHANICS

In standing, the ITB lies posterior to the hip axis and anterior to the knee axis and therefore helps to maintain hip and knee extension, reducing the muscle work required to sustain an upright stance. As the knee flexes to 30° the ITB passes posteriorly to the knee joint axis, and in so doing it glides over the lateral femoral condyle. In running, during the swing phase the ITB lies anterior to the greater trochanter and hip flexion/extension axis, reducing the workload required for hip flexion.

The contraction of the gluteus medius and the TFL is transmitted by the ITB to control and decelerate adduction of the thigh (7). Where the gluteus medius shows poor endurance and control, gait alteration may occur leading to ITB pain. In a study of distance runners (14 male, 10 female) with ITBS significant weakness of the gluteus medius was found on the symptomatic side. Strengthening the muscle over a 6-week period resulted in 92% of the runners being pain free (8).

Muscle balance tests for the lower limb (4) often show a reduction in abduction endurance by the gluteus medius (side lying hip abduction test, Fig. 2) and compensation by over activity of the tightening of the TFL-ITB (Ober test, Fig. 3). Although both the gluteus medius and the TFL are able to abduct the femur, the TFL will also medially rotate the hip while the postural posterior portion of the gluteus medius is a lateral rotator (9). As a consequence, dependence on the TFL alone for abduction power during gait causes excessive medial rotation and adduction of the hip increasing the valgus stress on the limb and therefore increasing passive tension in the ITB. For more information on muscle balance of the lower limb see Norris (4).

PALPATION

As with many overuse conditions, a subject may not have pain when they initially present for treatment. Pain may be elicited to palpation with the subject in the side lying test position, but with the knee flexed to 30°. Pain is commonly located approximately 2cms above the knee joint line within the distal portion of the ITB. The sensation which the patient feels on activity may often be reproduced by asking then to flex and extend the knee while palpation pressure is maintained (Fig 4). This will cause the ITB to flick over the epicondyle.

The same test may be performed in both standing (Fig.4a) and supine lying (Fig.4b). In standing the patient takes weight through the affected leg alone, knee flexed to 30°. The palpating finger is placed over the epicondyle once more and the subject performs a series of mini squats to reproduce his/her symptoms (Renne's test) (10). In lying the hip and knee are flexed to 90° and the epicondyle palpation is maintained as the knee is extended (Noble's test) (11).

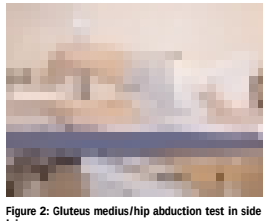


Figure 2: Gluteus medius/hip abduction test in side lying

Figure 4b: Pain provocation in lying

Figure 3: Ober test

Figure 4a: Pain provocation in standing

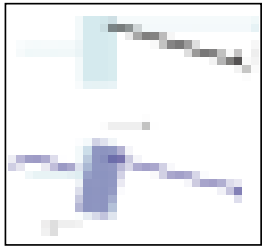


Figure 5: False hip abduction in side lying

Palpation of the greater trochanter is similarly achieved in side lying with the upper leg allowed to fall into adduction and medial rotation. Again palpation pressure is maintained over the ITB as the hip is moved.

REHABILITATION

Rehabilitation aims to redress the muscle imbalance process which may be considered as a major factor in the development of this condition.

- In phase (I) the aim is to stretch the tight lateral structures and build the endurance of the gluteus medius muscle.
- In phase (II) general hip and lumbo-pelvic alignment is enhanced with an emphasis on controlling the weight shift during single leg standing especially.
- Phase (III) is more sport specific and seeks to build control of the hip in functional sports actions.

Phase (I)

Stretching the ITB is a subject of considerable debate. As the band attaches directly to the femur via the intermuscular septa, lengthening it would seem impossible (12). However clinically, patients with ITBS do respond to stretching exercises showing increased range of motion, reduced pain and an alteration in tissue tension to palpation. It is suggested therefore that the superficial portion has some independence from the deeper portions.

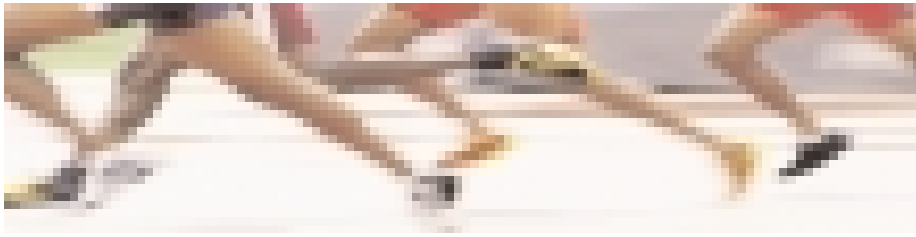
An effective ITB stretch must combine movement in three regions, the pelvis, hip, and knee. In order to stretch the ITB, hip adduction and extension on a fixed pelvis must be combined with knee extension. Justification for this joint positioning is that ITBS occurs when the gluteus medius shows poor endurance, and single leg standing is supported by action of the tensor fascia lata (TFL) alone. This muscle is overworked and develops painful trigger points. To limit the pelvis tipping laterally, the muscle tone increases and the muscle 'shortens', or more accurately becomes overactive in its outer range. As the TFL is placed anteriorly, a position of hip extension will stretch it. The ITB passes over the knee to attach into the head of the fibula and the lateral fascia covering the knee. This tissue is placed on stretch when the knee is extended and tension is taken from it as the knee is flexed. Combining hip adduction-extension with knee extension will therefore optimally stretch the ITB. Stretch will however be taken off the fascia if false hip adduction is performed. This can occur in the side lying position (Fig. 5) if the pelvis tilts laterally allowing the anterior superior iliac spine (ASIS) to move caudally.

To perform an effective ITB stretch the pelvis must remain fixed. The Ober test position (13) is chosen in the first instance, with the affected leg uppermost. Initially the leg is abducted (45° to the horizontal) and extended (10-15° behind the bodyline). The underside of the trunk is then pressed into the floor and kept in this position throughout the exercise. The upper leg is then lowered back towards the horizontal while maintaining the extended leg position. A useful visual cue is for the subject to look down towards their foot. If they can see their patella, the hip extension has been lost, if they cannot, the leg is extended and the view of the patella is blocked by the front of the pelvis. A tactile cue which may be used is to place a folded towel between the floor and the side of the body, just above the pelvis. The aim is to press down hard on the towel throughout the exercise. It should be noted that performing the Ober test with either knee flexion or with knee extension has been shown to produce significantly different values of hip adduction (14). For this reason it is recommended that both knee positions are tried and that which yields a greater stretching sensation be chosen as an exercise.

Figure 6a: Lumbo-pelvic alignment in normal standing

Figure 6b: Good lumbo-pelvic alignment with weight shift

Figure 6c: Poor lumbo-pelvic alignment (pelvic dip) with weight shift



The Ober stretch targets the whole of the ITB. However, where trigger points are present within the TFL-ITB, these tissues may be placed on stretch and a self massage technique employed. Now, the starting position is for the subject to lie on their back and to flex the hip and knee of both legs. The unaffected leg is crossed over the affected one and the hip pulled into adduction. This places some stretch on the upper portion of the ITB and allows the subject to press into the painful area 15-25 cms below the greater trochanter. Where a painful trigger point is found, firm pressure should be applied and held for 30-40 seconds until the pain begins to subside. This form of self treatment, called 'ischaemic compression' is an accepted method of management for an active trigger point (15).

In parallel with stretching the TFL-ITB, the gluteus medius muscle must be enhanced. Several authors have described lack of inner range holding to be the major dysfunction of this muscle (5,9). In this situation, the muscle is unable to hold the femur in a fully abducted (inner range) position over a prolonged period of time, normally up to 10 repetitions holding each for 10 seconds. To enhance this ability the subject begins lying on the side with the affected leg uppermost, hip and knee flexed. Keeping the feet together, the aim is to lift the knee without allowing any trunk rotation. Many subject with ITBS find this end position of the exercise difficult to achieve. In this case, a training partner is used to lift the leg into position and the subject tries to slowly lower the leg back to the starting position (eccentric control). Once this can be performed in a controlled fashion for 5 repetitions, the subject should begin the movement by holding the leg in the upper position (full inner range) again for 5 seconds (isometric control). Finally, the subject lifts the leg (concentric control) holds it in its upper position (isometric control) and lowers it slowly (eccentric control). Once this movement can be performed for 5-10 repetions, the subject can progress to phase (II) of the rehabilitation programme.

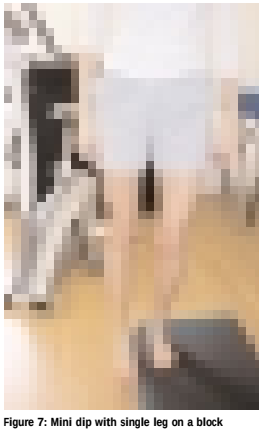


Figure 7: Mini dip with single leg on a block

Phase (II)

Rehabilitation in phase (II) sees the introduction of weight bearing activities maintaining lumbo-pelvic alignment as the weight is taken onto the affected leg. Exercises begin with weight shift actions (Fig. 6) moving the pelvis to the affected side while keeping it level and avoiding any hip 'dipping'.

Once the weight can be shifted in a controlled fashion, the knee on the unaffected leg is bent to take the weight off this side and leave the affected leg taking full bodyweight. Again control is the focus here. As the weight is shifted over the affected leg the pelvis should remain level, and as the unaffected leg is bent the pelvis must not dip towards this side or 'hitch' upwards. Lower limb alignment must also be emphasised as both excessive pronation and leg length discrepancy have been linked to ITB syndrome (16,17). The knee should remain directly over the centre of the foot, avoiding pronation (foot flattening) and hip adduction. The aim is to maintain precise alignment and to build muscle endurance. Progression is made of holding time therefore, holding the correct alignment for 20-30 seconds and performing 5-10 repetitions.

The next stage is to perform the same alignment pattern but to allow controlled bending of the knee on the affected side using the mini-squat exercise (Fig 7). The subject stands with the foot of the affected leg on a small (5 cms) block (a thick book or telephone directory is ideal). Keeping the pelvis horizontal they weight shift towards the affected leg and then lower into a single leg squat controlling the action and maintaining lower limb alignment throughout the movement. This mini squat is performed for 5-8 reps emphasising timing of the eccentric lowering aspect (5-10 seconds) rather than the concentric lifting (2-3 seconds).

The final exercise in phase (II) is the eccentric step up. If the right leg is affected, the subject steps up onto a low (10cms) platform leading with their left leg. They bring their right leg up onto the step and take the bodyweight through it as they lower the left leg to the floor. Repeating this action provides concentric work for the unaffected (left) leg and eccentric work for the affected (right) leg. Leg and pelvic alignment are emphasised throughout the movement, and 8-10 repetitions are performed emphasising the low-

ering portion of the movement as before.

Phase (III)

Training in phase (III) is designed to form a bridge between rehabilitation exercises and sport itself. The emphasis now is training specificity, - that is matching the exercises as closely as possible to the demands of sport. Phases (I) and (II) have re-established muscle balance around the hip and the subject is now able to take full bodyweight on the affected leg while maintaining optimal lumbo-pelvic alignment. They can perform multiple repetitions of this movement showing that postural endurance has been built up. However, they have only performed a limited number of exercises so there 'exercise vocabulary' is quite restricted. Further, the exercises in phase (I) and (II) were not matched to a particular sport, but where designed to isolate the body area causing pain.

In phase (II) the subject performed the mini-squat exercise which emphasised leg and pelvic alignment while flexing the knee. This is now progressed with eccentric step walking. The subject simply uses walking down stairs/steps as an exercise. The lowering phase should be emphasised to take 5-8 seconds with each step and 8-10 steps should be practiced per set. This emphasises muscle work while minimising repetitive joint movement. Once this can be performed pain free, normal gait timing is used and a greater number of repetitions performed. A typical programme would include 3 - 5 sets jogging up steps and walking down. This motion is progressed finally to step running where the subject jogs up the steps and then jogs down.

There are obvious safety considerations with jogging down steps, and the trainer / coach must emphasise these and ensure that the action is performed in a controlled fashion at all times.

In terms of muscle work a deeper step is harder because the range of motion is greater. However as the pain of ITBS occurs early in the range of motion, increasing the number of repetitions rather than the range of motion is a greater challenge to the ITB itself. In a similar vane, total time is a progression for this condition.

The next exercise is slope running. Although running down a slope is less demanding in terms of muscle work than running down stairs, slope running can be performed for a longer period before fatigue sets in and this greater time increases the requirement of alignment control to prevent friction onset. Sets of 3-4 minutes are used to begin, building to 10-15 minutes. A sidestep action may also be used with the affected leg as the downhill leg. If alignment is degrading towards the end of the set, postural endurance is being lost. The point at which the set is stopped should therefore be when alignment begins to be lost rather than when the timescale of the set is completed.

The phase (III) exercises here have emphasised postural endurance during the eccentric component of running (downhill) because this is the motion which most often gives rise to symptoms. However, if the condition has occurred in other sports, movements specific to those sports should be chosen. Table - gives several examples of eccentric actions for different sports. Tor to check this out

ACTION/SPORT GIVING SYMPTOMS	ECCENTRIC ACTION USED IN PHASE (III) REHAB
■ Step aerobics	■ Step down from low step leading with unaffected leg
■ Squat in weight training ■ Sitting into low chair	■ Squat onto medium height stool ■ Squat onto medium height and then low stool
■ Racquet sports	■ Slow lunge leading with affected leg ■ Declined 10° road run
■ Road running ■ Fell running	■ Declined 20° slope run with / without sidestep ■ Static cycle varying saddle height
■ Cycling	
■ Sking	■ Mini-squat on balance (wobble) board maintaining bent knee position.

THE AUTHOR

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