

Review

# Iliotibial band friction syndrome—A systematic review

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Received 19 October 2004; received in revised form 19 July 2006; accepted 30 August 2006

## Abstract

Iliotibial band friction syndrome (ITBFS) is a common injury of the lateral aspect of the knee particularly in runners, cyclists and endurance sports. A number of authors suggest that ITBFS responds well to conservative treatment, however, much of this opinion appears anecdotal and not supported by evidence within the literature. The purpose of this paper is to provide a systematic review of the literature pertaining to the conservative treatment of ITBFS.

A search to identify clinical papers referring to the iliotibial band (ITB) and ITBFS was conducted in a number of electronic databases using the keyword: *iliotibial*. The titles and abstracts of these papers were reviewed to identify papers specifically detailing conservative treatments of ITBFS. The PEDro Scale, a systematic tool used to critique randomized controlled trials (RCTs), was employed to investigate both the therapeutic effect of conservative treatment of ITBFS and also to critique the methodological quality of available RCTs examining the conservative treatment of ITBFS.

With respect to the management of ITBFS, four RCTs were identified. The interventions examined included the use of non-steroidal anti-inflammatory drugs (NSAIDs), deep friction massage, phonophoresis versus immobilization and corticosteroid injection.

This review highlights both the paucity in quantity and quality of research regarding the conservative treatment of ITBFS. There seems limited evidence to suggest that the conservative treatments that have been studied offer any significant benefit in the management of ITBFS. Future research will need to re-examine those conservative therapies, which have already been examined, along with others, and will need to be of sufficient quality to enable accurate clinical judgements to be made regarding their use.

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*Keywords:* Iliotibial band; Iliotibial band friction syndrome; Systematic review; Conservative treatment

## 1. Introduction

Iliotibial band friction syndrome (ITBFS) was first specifically described by Renne (1975) as a pain felt on the lateral aspect of the knee with lower limb activities such as running and cycling. Following an increase in the popularity of running and other endurance multi-disciplinary sports, since the 1980s, ITBFS has become more common (Anderson, 1991; Kirk et al., 2000). The overall incidence of ITBFS can range from between 1.6% and 52% depending on which population you examine

(Kirk et al., 2000; Brosseau et al., 2004). However, it is generally accepted that ITBFS is the most common running injury of the lateral knee, and has an incidence of between 1.6% and 12% (Orava, 1978; McNicol et al., 1981; Messier et al., 1995; Fredericson et al., 2000; Taunton et al., 2002). Within cycling, ITBFS is believed to account for 15–24% of overuse injuries (Farrell et al., 2003; Holmes and Pruitt, 1993). Its incidence in military recruits may range from 1% to 5.3% (Jordaan and Schwellnus, 1994; Almeida et al., 1999). ITBFS is uncommon in the inactive population (Orava, 1978).

The aetiology of ITBFS is multi-factorial with representation of both intrinsic and extrinsic factor (McNicol et al., 1981; Kirk et al., 2000; Taunton et al., 2002). ITBFS in a non-traumatic overuse injury caused

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by friction/rubbing of the distal portion of the iliotibial band (ITB) over the lateral femoral epicondyle (LFE) with repeated flexion and extension of the knee. Orchard et al. (1996) describe an 'impingement zone' which occurs at approximately 30° of knee flexion during foot-strike and early stance phase. At approximately 30° and greater, of knee flexion, the ITB passes over and posterior to the LFE (Renne, 1975; McNicol et al., 1981; Anderson, 1991; Barber and Sutker, 1992; Aronen et al., 1993; Puniello, 1993; Messier et al., 1995; Novacheck, 1998; Fredericson et al., 2002; Farrell et al., 2003). During the impingement period, eccentric contraction of the tensor fascia lata (TFL) and gluteus maximus, to decelerate the leg whilst running, exert great tension through the ITB (Orchard et al., 1996; Kirk et al., 2000; Farrell et al., 2003). Farrell et al. (2003) described a similar impingement zone for cycling.

The pathogenesis of ITBFS involves inflammation and irritation of the lateral synovial recess (Renne, 1975; Orava, 1978; McNicol et al., 1981; Ekman et al., 1994; Nemeth and Sanders, 1996; Nishimura et al., 1997; Kirk et al., 2000; Levin, 2003), as well as continued irritation of the posterior fibres of the ITB (Ekman et al., 1994; Fredericson et al., 2000; Kirk et al., 2000; Austermuehle, 2001; Fredericson et al., 2002) and inflammation of the periosteum of the LFE (McNicol et al., 1981; Noble et al., 1982; Nishimura et al., 1997; Fredericson et al., 2002), all of which describes the pathogenesis of ITBFS. Kirk et al. (2000) suggest that with repetitive soft tissue irritation there is simply not enough time for the body to repair these damaged tissues. This may lead to further irritation and injury which, in theory, would extend the area of the impingement zone and increase the risk of irritation (Levin, 2003).

A number of authors have commented that ITBFS responds well to conservative treatment (Anderson, 1991; Kirk et al., 2000; Levin, 2003) with success rates reported as high as 94% (McNicol et al., 1981). A number of different treatment options are reported in the literature, however, it should be questioned whether these treatments are delivered based on sound evidence.

The purpose of this paper is to perform a systematic review, evaluating the efficacy of conservative treatment of ITBFS, in order to highlight key concepts to guide evidence-based practice in the management of ITBFS. Relevant functional anatomical and biomechanical contributions to the aetiology and pathomechanics of ITBFS will also be discussed and related back to the findings of the RCTs available.

## 2. Methodology

### 2.1. Literature search strategy

A search to identify clinical papers, clinical reviews and clinical trials pertaining to the ITB and ITBFS, was

conducted in electronic databases, subscribed to by the Auckland University of Technology (AUT) library, which included MEDLINE via PubMed (from 1966 onwards), Cumulative Index to Nursing and Allied Health Literature (CINAHL) (from 1983 onwards), The Cochrane Controlled Trials Register in the Cochrane Library (latest edition), SPORT-Discus (from 1830 onwards), Allied and Complementary Medicine Database (AMED) (from 1985 onwards), Blackwell-Synergy, Master FILE (from 1975 onwards), Expanded Academic ASAP (from 1980 onwards), Index New Zealand (INNZ) (from 1987 onwards), Lippincott 100 Nursing and Health Science Collection, Physiotherapy Evidence Database (PEDro) (from 1953 onwards), ProQuest 5000 International, ProQuest Health and Medical Complete, Web of Science (from 1945 onwards), Wiley Interscience–Life and Medical Sciences Titles. This search was conducted in August–September 2004.

The ITB and ITBFS were deemed to be relatively narrow fields to search, therefore only one Medical Subject Heading (MESH) was used as a keyword: *iliotibial*. There was no limitation regarding date or language leading to 1260 citations being identified of which many were repeated across databases.

The titles and/or abstracts of these citations were reviewed to identify papers specifically detailing the aetiology and conservative treatment of ITBFS and the anatomy and biomechanics of the ITB. The bibliographies of each paper were also used for cross-referencing to identify other relevant papers.

### 2.2. Study selection

*Inclusion criteria:* The following criteria were used in order to select relevant papers to be included within this review:

*Type of participant:* Participants to be 18 years of age and older, of either gender and have a clinical diagnosis of ITBFS for greater than 14 days duration.

*Type of study design:* Randomized controlled trials.

*Type of intervention:* Conservative treatment of ITBFS, i.e. non-surgical.

*Outcome measurements:* To include at least one of the following outcome measurements: pain rating (e.g. Visual Analogue Scale (VAS)), function-specific VAS (i.e. work or sport related pain), time from diagnosis until symptom free, return to work and/or sport status.

*Exclusion criteria:* The following criteria were used to eliminate papers from this review: papers written in non-English languages, non-RCTs, RCTs which utilized non-conservative treatment, i.e. surgical interventions.

### 2.3. Review of methodological quality

Three reviewers independently assessed each of the RCTs identified for their respective methodological quality. The PEDro Scale (see Table 1), developed by The Centre of Evidence-Based Physiotherapy (CEBP) was utilized to assess each paper. The PEDro Scale is an 11-item scale, which is a validated and versatile tool used to rate RCTs for the PEDro Database (Clark et al., 1999; Maher et al., 2003).

An overall score of methodological quality, or quality score (QS), was determined for each paper by each of the three reviewers as a total of positive scores for each of the 11 items. A consensus method was used to discuss and resolve discrepancies between the markings of each paper between the reviewers. The agreed QS for each

paper are included in Table 2.

The PEDro Scale is an 11-item scale. The various items deal with differing aspects of RCT analysis including internal validity, external validity and statistics. In order to allow quantitative analysis of the overall methodological quality of each study, seven items which relate to internal validity were identified. These seven items include the following items numbers 2, 3, 5, 6, 7, 8, 9 (refer to Table 1). The positive scores of each of these seven items is added together to calculate an Internal Validity Score (IVS) (Reid and Rivett, 2005).

### 2.4. Analysis of methodological quality

Based on the IVS of each paper, it is possible to make a qualitative assessment about the methodological quality. In the instance whereby the RCTs reviewed are not clinically heterogeneous, it is appropriate to use a qualitative method of analysis as quantitative analysis is made difficult in that the RCTs may not be directly comparing like interventions (Reid and Rivett, 2005; van Tulder et al., 1997).

The qualitative assessment used within this review is an adaptation of those used by several authors (Karjalainen et al., 2001; Reid and Rivett, 2005) modified specifically for IVS obtained in this review using the PEDro Scale:

*Level 1: Strong evidence*—when provided by generally consistent findings in multiple RCTs of high quality (IVS = 6–7).

*Level 2: Moderate evidence*—when provided by generally consistent findings in one RCT of high quality (i.e. IVS = 6–7) and one or more lower-quality RCTs (i.e. IVS ≤ 5);

*Level 3: Limited evidence*—when provided by generally consistent findings in one RCT of moderate quality (i.e. IVS = 4–5) and one or more low-quality RCTs (i.e. IVS ≤ 3).

*Level 4: Insufficient evidence*—when provided by generally consistent findings of one or more RCTs of limited quality (i.e. IVS ≤ 3), no RCTs available or conflicting results.

Table 1  
PEDro scale (modified from Maher et al., 2003)

Criteria	Score	
1. Eligibility criteria were specified	No (0)	Yes (1)
2. Subjects randomly allocated to groups	No (0)	Yes (1)
3. Allocation was concealed	No (0)	Yes (1)
4. Groups similar at baseline regarding the most important prognostic factors	No (0)	Yes (1)
5. Blinding of all subjects	No (0)	Yes (1)
6. Blinding of all therapists who administered therapy	No (0)	Yes (1)
7. Blinding of all assessors who measured at least one outcome	No (0)	Yes (1)
8. Measures of at least one key outcome were obtained from more than 85% of initially allocated subjects	No (0)	Yes (1)
9. All subjects for whom outcome measures were available received treatment or control as allocated, or if this was not the case, at least one outcome measure analysed using 'intention to treat' analysis	No (0)	Yes (1)
10. The results of between-group statistical comparisons are reported for at least one key outcome	No (0)	Yes (1)
11. The study provides both point measures and measures of variability for at least one key outcome	No (0)	Yes (1)
Total	x/11	

Table 2  
Randomized controlled trials of the conservative treatment of ITBFS in order of PEDro score

	Scores for PEDro criteria											QS	Methodological quality	IVS
	1	2	3	4	5	6	7	8	9	10	11			
Gunter and Schweltnus (2004) <i>Corticosteroid injection</i>	1	1	1	1	1	0	0	1	0	1	1	9	Moderate	4
Schweltnus et al. (1991) <i>NSAID's</i>	1	1	0	1	1	1	0	1	0	1	1	8	Moderate	4
Schweltnus et al. (1992) <i>Deep transverse friction massage</i>	1	1	1	0	0	0	1	0	1	1	1	7	Moderate	4
Bischoff et al. (1995) <i>Phonophoresis versus immobilization</i>	1	1	1	1	0	0	0	0	1	1	1	7	Limited	3

Note: QS = overall quality score; IVS = internal validity score.

Table 3  
Randomized controlled trials of the conservative treatment of ITBFS

Author	Patient demographics	Intervention	Control	Outcome	Results	IVS	QS
Gunter and Schwellnus (2004) <i>Corticosteroid injection</i>	<ul style="list-style-type: none"> <li>• <math>n = 18</math></li> <li>• Aged between 20 and 50</li> <li>• Control group mean age <math>28.9 \pm 5</math>, experimental group mean age <math>29.0 \pm 6.5</math></li> <li>• Duration of symptoms—within 14 days</li> </ul>	9 subjects with ITBFS  40 mg methylprednisilone, 10 ml 1% lignocaine hydrochloride, injection deep to the ITB at knee lateral joint line	9 subjects with ITBFS  20 mg 1% lignocaine hydrochloride injection deep to the ITB at knee lateral joint line	Baseline test: a previous validated treadmill-running test—pain whilst running (VAS)—every minute  Running speed at subjects previous best speed, maintained for 30 min (after 5 min warm-up) or until the pain on VAS reached 8 “Total Daily Pain”: evening pain (VAS) over 14 day period “Total pain during running” (VAS): repeated on days 7 and 14 after injection (Mean taken)	Decrease ( $P = 0.01$ ) in running pain from day 7 to 14 in a validated treadmill running test and VAS, intervention group compared to controls	4	9
Schwellnus et al. (1991) <i>NSAID's</i>	<ul style="list-style-type: none"> <li>• Over 18 yr incl</li> <li>• Final incl 43 pts</li> <li>• Age range not given—group 1 mean <math>22 \pm 5</math>, group 2 mean age <math>24 \pm 6</math>, group 3 mean age <math>22 \pm 2</math></li> <li>• Duration of symptoms—group 1 mean <math>6.8 \pm 7.1</math> weeks, group 2 mean <math>6.1 \pm 8.1</math> weeks, group 3 mean <math>7.4 \pm 13.1</math> weeks</li> </ul>	(a) 14 subjects with ITBFS 50 mg diclofenac, physiotherapy (b) 16 subjects with ITBFS 400 mg ibuprofen, 500 mg paracetamol, 20 mg codeine phosphate, physiotherapy (ITB stretch, ultrasound, deep friction massage)	13 subjects with ITBFS  Physiotherapy (ITB stretch, ultrasound, deep friction massage) only	<i>As for Gunter and Schwellnus (2004)</i>  For total daily pain (VAS)—mean pain measured over 14 days	Decrease ( $P < 0.05$ ) in overall pain experienced over trial period. Decrease ( $P < 0.05$ ) in running pain from day 0 to 3 in a validated treadmill running test for (b) intervention group. Increase ( $P < 0.05$ ) in running distance in all groups from days 3 to 7, and in (b) intervention group from days 0 to 7	4	8

Table 3 (continued)

Author	Patient demographics	Intervention	Control	Outcome	Results	IVS	QS
Schwellnus et al. (1992) <i>Deep transverse friction massage</i>	<ul style="list-style-type: none"> <li>● <math>n = 20</math> over 18 yr</li> <li>● Group 1 mean <math>25 \pm 6</math>, group 2 mean <math>29 \pm 5</math>, no range for ages given</li> <li>● Duration of symptoms group 1 <math>23 \pm 17</math> weeks, group 2 <math>74 \pm 95</math> weeks</li> </ul>	<p>9 subjects with ITBFS</p> <p>Deep transverse friction massage to the distal ITB from days 3 to 14 daily stretching and twice-daily ice therapy from days 0 to 14. Ultrasound to the distal ITB from days 3 to 14</p>	<p>8 subjects with ITBFS</p> <p>Daily stretching and <math>\times 2</math>—daily ice therapy from days 0 to 14. Ultrasound to the distal ITB days 3–14</p>	<p>Total running pain (VAS)—treadmill test performed on days 0, 3, 7, 14 (Mean taken)</p> <p>As for Gunter and Schwellnus (2004)</p> <p>For total daily pain (VAS)—mean pain measured over 14 days. Total running pain (VAS)—treadmill test performed on days 0, 3, 7, 14 (Mean taken)</p>	<p>Decreases in daily pain (VAS) and running pain during a validated treadmill running test in both groups. However, no significant difference between groups</p>	4	7
Bischoff et al. (1995) <i>Phonophoresis versus immobilization</i>	<ul style="list-style-type: none"> <li>● <math>n = 25</math>, Navy students</li> <li>● Group 1 mean 22 yr, group 2 mean 23 yr</li> <li>● Duration of symptoms—group 1 mean 17.5 days, group 2 mean 15.0 days</li> </ul>	<p>13 subjects with ITBFS</p> <p>Phonophoresis (ultrasound through 10% hydrocortisone cream) over 2 weeks</p> <p>Rest, ice, stretching and ibuprofen</p>	<p>13 subjects with ITBFS</p> <p>Knee immobilization over 2 weeks</p> <p>Rest, ice, stretching and ibuprofen</p>	<p>“Number of days from diagnosis to pain-free examination”</p> <p>“Number of days from diagnosis to symptom-free 1 mile run”—symptom-free = “without pain or stiffness”</p> <p>Subjects were examined daily through the study</p>	<p>Less days to become pain free whilst treadmill running for intervention group compared to control group. More subjects from intervention group recovered from ITBFS in 10 days compared to control group</p>	3	7

For this review it was decided amongst the reviewers that in using a seven-item IVS, taken from the initial PEDro score (QS), a study of *high* methodological quality was one with an IVS of between 6 and 7, *moderate* quality between 4 and 5, *limited* quality between 0 and 3.

### 2.5. Analysis

When RCTs were clinically and therapeutically heterogeneous, there is no available method to directly assess the relative benefit (or lack thereof) of one intervention versus another. In this instance, previous systematic reviews have decided to not include quantitative analysis for this very reason (Reid and Rivett, 2005). Therefore, it was decided not to perform any quantitative analysis, as no direct comparison could be made to determine clinical or therapeutic benefit between the RCTs and interventions examined.

## 3. Results

### 3.1. Selection of studies

Four RCT's regarding conservative management of ITBFS meeting the inclusion criteria were identified following the electronic and cross-referencing searches. These studies are summarized in Table 3.

### 3.2. Methodological quality

The methodological quality, statistically represented by the IVS, for each paper is detailed within Table 2. Three of the four RCTs reviewed were given an IVS of four. This suggests that the authors felt that these studies were of *moderate* methodological quality. One of the RCTs was given an IVS of three, suggesting the authors felt this study was of *limited* methodological quality.

All of the four RCTs satisfied the item relating to random allocation of subjects (Item 2). Otherwise, there were no clear trend towards any of the other internal validity rated items (3, 5, 6, 7, 8, 9) either being universally satisfied or not.

### 3.3. Study characteristics

The first important point to note is that all of the four RCTs assess different therapeutic interventions. Therefore, they were clinically and therapeutically heterogeneous. See Table 3 for detail of the each study's characteristics.

### 3.4. Efficacy

Because four different therapeutic interventions were used, it is difficult to make direct comparison of therapeutic benefit using quantitative analysis. However, qualitative analysis is possible when assessing the methodological quality of the RCTs examining conservative treatment of ITBFS. Of the four RCTs identified, three had IVS's of 4 (refer to Table 2). Using the qualitative rating system, as mentioned earlier, it appears there is *limited evidence* (Level 3) to support the use of conservative interventions in the treatment of ITBFS. Some discussion of the key features of these studies is reported by intervention as follows.

#### 3.4.1. Non-steroidal anti-inflammatory drugs (NSAIDs)

Schwellnus et al. (1991) conducted a RCT on 43 patients with unilateral ITBFS with pain that was severe enough to limit running or who had had to stop running as a consequence of the pain. Subjects were randomly allocated to three groups. Initial treatment to all subjects consisted of rest, ice application and medication from day 0 to 7. From day 3 to 7 all subjects received standard physiotherapy treatment consisting of ultrasound, transverse friction massage (on days 3, 5 and 7) and daily ITB stretching. The medication was delivered over the 7 days in a double blind, placebo-controlled fashion with Group 1 given a placebo anti-inflammatory medication, Group 2 an anti-inflammatory only (50 mg diclofenac) and Group 3 a combined anti-inflammatory/analgesic (400 mg ibuprofen, 500 mg paracetamol, 20 mg codeine phosphate) medications. Outcome measures included both daily pain and running pain, each measured via the visual analogue scale (VAS). Running pain was measured by a validated treadmill test at 3 and 7 days after treatments commenced.

Results of this study demonstrated that during the first week of treatment, physiotherapy in conjunction with combined anti-inflammatory/analgesic medication was the most effective management. Significant differences were seen in the combined group with decreased running pain and increased running time/distance from 0 to 7 days, compared to the other experimental groups. The combined group was also the only group to show a significant decrease in running pain at the 3-day test. It was of interest to note that there was a significant reduction in daily pain seen across all groups.

#### 3.4.2. Deep transverse friction massage (DTFM)

Schwellnus et al. (1992) commented that the use of DTFM, in the treatment of ITBFS, is often reported on the basis of anecdotal evidence that it might be effective. Schwellnus et al. (1992) also commented that it seems contradictory that friction techniques may be beneficial in an injury where the mechanism of the injury is friction. In order to test these two statements Schwellnus

et al. (1992) conducted an RCT to establish the therapeutic benefit of DTFM. Twenty subjects with chronic ITBFS (>14 days duration) were randomly divided into two groups. Both groups received treatment consisting of rest (apart from treadmill running exercise tests), ice twice a day and baseline physiotherapy treatment of daily stretching exercises to the ITB and 5 min of therapeutic low dose ultrasound on days 3, 5, 7 and 10. The intervention group were also given DTFM for 10 min on the treatment days whereas the control group received only the general physiotherapy treatment on the same days. Results of this study found that daily pain and treadmill running pain levels were both significantly reduced ( $P = 0.0005$ ) in both groups with the authors concluding that the addition of deep friction massage did not alter the therapeutic outcome of the condition.

#### 3.4.3. Phonophoresis versus immobilization

Bischoff et al. (1995) conducted an RCT comparing phonophoresis (using 10% hydrocortisone cream as the active drug) and knee immobilization, over a 2-week period in a group of navy diving students who had developed ITBFS as a result of rigorous physical training involving a significant amount of running. All subjects were of similar age (22–23 years) and had symptoms for 15–17 days prior to entering the trial. The subjects were randomly assigned to either the knee immobilization group (three panel knee immobilizer) or the phonophoresis group. All subjects received ice massage and non-steroidal anti-inflammatory medication. Outcome measures in this study were the number of days required until pain free on examination and the ability to run on a treadmill at 6.5 miles per hour. Results of this study concluded subjects in the phonophoresis group recovered from the injury in fewer than 10 days and had significantly less pain during the treadmill running test than the immobilization group.

#### 3.4.4. Corticosteroid injection

Gunter and Schweltnus (2004) conducted an RCT looking at 18 runners with an acute onset of ITBFS (<14 days duration). Subjects were randomly allocated into two groups: Group A receiving an injection of corticosteroid (40 mg methylprednisilone and 10 mg 1% lignocaine hydrochloride) deep to the distal ITB, and Group B receiving a placebo injection (20 mg 1% lignocaine hydrochloride). Subjects were instructed not to run for 14 days following the injection and to apply ice to the area twice daily at 12 h intervals for 30 min. No physiotherapy treatment was provided to subjects in this study. Outcome measures were pain measured with a VAS and an ability to perform a treadmill running test for 30 min at the subjects best recent 10 km running speed on days 7 and 14 following the injection. Although there was a clinical improvement in both

groups, a significant ( $P = 0.01$ ) decrease (30%) in running pain (measured with a VAS following a treadmill test) was observed in the cortisone injection group compared to control group.

## 4. Discussion

### 4.1. The conservative management of ITBFS

The results of this review identified only four RCTs regarding the conservative management of ITBFS. These RCTs investigated four different types of treatments including NSAIDs deep friction massage, phonophoresis versus immobilization, and corticosteroid injection. Some discussion of the key features of these studies is pertinent. Following the qualitative statistical analysis, the authors of this review concluded that there is *limited* evidence to suggest that the conservative treatments analysed here are beneficial in the treatment of ITBFS.

From this review, it is evident that in the majority of studies a course of physiotherapy treatment was used as baseline, which involved a combination of ice, ultrasound, deep friction massage and stretching. Indeed, it is not uncommon to find reference to the conservative treatments, within the literature pertaining to treatment of ITBFS. In light of the analysis contained within this systematic review, it seems ironic that many of these interventions are commonly used within clinical practice and their use appears to be based on no firm evidence- and research-based rationale.

### 4.2. Methodological quality

Three of the four RCTs reviewed (Schweltnus et al., 1991, 1992; Gunter and Schweltnus, 2004) were given an IVS of four suggesting the authors felt that these studies were of *moderate* methodological quality. Analysis of these studies, indicate there appears to be some benefit from using NSAIDs/analgesics and corticosteroid injections and no benefit from using DTFM.

The fourth RCT (Bischoff et al., 1995) examined phonophoresis versus immobilization. This study concluded that phonophoresis was more beneficial compared to immobilization. However, there was no blinding evident throughout this RCT and the present authors deemed that this study was of *limited* methodological quality. It is very difficult to therefore deem this study worthy of consideration when making educated judgement as to the true effectiveness of these interventions in the management of ITBFS.

Of most interest was the lack of attention of all the studies to the various aspects of blinding. For example, only two studies (Schweltnus et al., 1991; Gunter and Schweltnus, 2004) satisfied the items relating to subject

blinding (Item 5). The other two RCTs either did not adequately blind the subjects or did not mention this. Only one of the four RCTs satisfied the respective items relating to therapist blinding/Item 6 (Schwellnus et al., 1991) and assessor blinding/Item 7 (Schwellnus et al., 1992). The study by Bischoff et al. (1995) did not satisfy any of the items relating to blinding, either because there was no blinding or that blinding was not mentioned.

#### 4.3. Future research

Following the extensive literature search, carried out for this review, there is an obvious paucity of research concerning the conservative management of ITBFS. Not only is there a lack in quantity of such research, upon dissection of the scarce research that is available, there seems to also be a paucity of quality.

It now seems apparent that for any of the many varieties of conservative therapies, for treatment of ITBFS, that there is no research base available to conclude any clear benefit from the clinical use of any of the conservative therapies mentioned. If this is indeed the case, then future research must attempt to fill this void.

From the RCTs that were available, it seems that the methodological quality of all these studies was well below a level that allowed any credible conclusions or answers to be sought. Additionally, common to all these studies was a lack of systematic blinding. It would be advisable for future research to acknowledge this problem and attempt to organize more robust methodology in order to answer the important research questions asked.

Not only were the interventions heterogeneous through the four RCTs reviewed, so to were a number of other key features including outcome measures and duration of subjects symptoms. With regard to duration of symptoms, some papers looked at the more acute stages of ITBFS (i.e. Bischoff et al. (1995) and Gunter and Schwellnus (2004) within 2 weeks) compared to more chronic duration (i.e. Schwellnus et al. (1992) at approximately 2 months or greater). It would be pertinent for future research to acknowledge clearly the duration of symptoms (i.e. acute versus chronic) as it is likely that some conservative treatments may have relatively greater or lesser impact at different pathological stages throughout the course of ITBFS presentation. For example, the studies looking at corticosteroid and NSAID use (Schwellnus et al., 1991; Gunter and Schwellnus, 2004) may have more application in an early phase of ITBFS where acute inflammation may be more of a clinical problem and needing to be addressed. Further to this point, for more chronic presentations of ITBFS, it may be more appropriate to guide research to look at more rehabilitation management, such as ITB stretching, pelvic and knee muscle stabilization, DTFM, orthotics prescription, etc.

With respect to outcome measures, it is not only important to gain some homogeneity in intervention selection but also consistency in outcome measures selected if there is going to be quantitative analysis of therapeutic benefit of conservative treatments for ITBFS. As Reid and Rivett (2005) have stated, direct quantitative comparison, within the realms of systematic review, is very difficult when interventions, and also outcome measurements for that matter, are heterogeneous. Throughout three of the four RCTs reviewed (Schwellnus et al., 1991, 1992; Gunter and Schwellnus, 2004) the same previously validated treadmill running test was used to score running pain. This outcome measure seems to be appropriate for ITBFS and is also becoming more widely used. Perhaps a validated test like this could become a standard test in ITBFS research.

From a biomechanical and pathological perspective, the knowledge base regarding ITBFS seems to be healthy. The clinical application of such theories is both possible and plausible. There now needs to be research of sufficient quality and quantity to enable these theories to be challenged and either accepted or discarded.

## 5. Conclusion

ITBFS is a common repetitive strain injury of the lateral aspect of the knee. The pathomechanics and clinical presentation are well understood. However, trying to determine the most appropriate choice of conservative therapy has been made difficult by paucity in quality and quantity of RCTs to examine therapeutic benefit.

The aetiology of ITBFS is multifactorial, with a combination of intrinsic and extrinsic factors. The causes of ITBFS are in response to the complex functional anatomy of the ITB and its action as an independent structure and indirectly through the muscles that it provides attachment to.

Reviewing the efficacy of the conservative management of ITBFS has highlighted that there are a small number of RCTs investigating the effects of therapeutic interventions on ITBFS. Within the acute stage of the presenting symptoms (less than 14 days duration) corticosteroid injection alone appears to be beneficial with subjects able to return to running pain-free with 14 days of the intervention. In the more chronic presentations (greater than 14 days duration), there appears to be benefit gained from using both combined anti-inflammatory/analgesic medication over anti-inflammatories alone. The inclusion of DTFM to a standard physiotherapy programme of ultrasound and stretching exercises, does not appear to produce any additional benefit. In all of the reviewed trials this generalized physiotherapy programme proved to be beneficial in

reducing both daily pain and pain experienced on treadmill running. Although this provides positive confirmation regarding the benefits of conservative treatment for ITBFS, it is unfortunate that there are no RCTs examining the benefit of these different modalities specifically or in isolation. When investigating the novel delivery of anti-inflammatory medication via phonophoresis, a significant reduction in pain was accomplished when compared to immobilization.

The evidence for the use of conservative treatment in the management of ITBFS appears to be limited and of insufficient quality. The research that is available is heterogeneous and inconsistent. Further examination of the clinical effect of conservative therapies, in an ITBFS population, will be of great importance to evidence-based management of this condition and must direct future research.

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