

Radial extracorporeal shockwave therapy compared with manual therapy in runners with iliotibial band syndrome

Kristoffer Weckström^{a,*} and Johan Söderström^b

^a*IFK Mariehamn Fotboll, Wiklöf Holding Arena, Mariehamn, Finland*

^b*Muskelcentrum Uppsala AB, Uppsala, Sweden*

Abstract.

BACKGROUND: Although different conservative treatment options have been proposed, there is a paucity of research on the management of iliotibial band syndrome (ITBS) in runners.

OBJECTIVE: To compare two treatment protocols for ITBS; radial shockwave therapy (RSWT) and manual therapy (ManT). Both therapies were administered concurrently with an exercise rehabilitation programme.

METHODS: The study was designed as a randomised controlled clinical trial. Twenty-four runners with ITBS received 3 treatments at weekly intervals of either RSWT ($n = 11$) or ManT ($n = 13$). In addition, all subjects followed an exercise programme for at least 4 weeks. Main outcome measures were established as mean differences (MD) in pain during treadmill running.

RESULTS: There was no significant difference in pain reduction between the two interventions at 4 weeks ($p = 0.796$), and 8 weeks ($p = 0.155$) follow-up. Thus, both groups reported similar magnitude of reduced pain during the intervention ($p = 0.864$). The shockwave therapy (SWT) group reported a 51% decrease in pain at week 4 ($p = 0.022$), and a 75% decrease at week 8 ($p = 0.004$). The ManT group showed a 61% reduction in pain at week 4 ($p = 0.059$), and a 56% reduction at week 8 ($p = 0.067$).

CONCLUSIONS: RSWT and ManT were equally effective in reducing pain in subjects with ITBS.

Keywords: Iliotibial band syndrome, running, shockwaves, manual therapies, exercise therapy

1. Introduction

Iliotibial band syndrome (ITBS), characterised by increased pain over the lateral femoral condyle during exercise, is a common overuse injury that primarily affects runners [1–3]. The pain usually appears at a specific distance and decreases when fully extending the knee [4]. Irritation of the tractus iliotibialis (ITB) develops with repetitive knee flexion, particularly at the angle of 30 degrees [1,4,5]. The injury forces the athlete to run shorter distances until no training is possible [4]. As the injury accounts for up to 12% of overuse injuries in running and is the most typical cause of lat-

eral knee pain [3,6], developing effective management strategies for ITBS is crucial.

The ITB is a thick fascia which originates from the tubercle of the iliac crest [5,7], the tensor fascia latae, and the lateral gluteal muscles [8]. Then it passes distally and is attached to the retinaculum patellae lateralis, Gerdy's tubercle [5,7–9] and the proximal fibular head [5,7]. The ITB also attaches to the vastus lateralis muscle [10]. ITBS is traditionally believed to arise from repetitive flexion/extension of the knee, resulting in friction between the distal portion of the ITB and the lateral femoral condyle [1,5,11]. When running, the ITB passes over the lateral condyle and an inflammatory condition of the underlying tissue laterally of the knee is initiated [1,5,11]. Structures that may be affected by ITBS is the posterior fibers of the ITB [1,5,6,12,13], bursae [12], lateral synovial recess [11,12,14], the periosteum of the lateral femoral

*Corresponding author: Kristoffer Weckström, IFK Mariehamn Fotboll, Wiklöf Holding Arena, Mariehamn, Finland. Tel.: +358 400992619; E-mail: kristoffer.weckstrom@ifkmariehamn.com.

condyle [11,13] and adipose tissue [15]. Fairclough et al. argued that the ITB attaches distally to the femur through fibrous strings [15]. In contrast to what has been described earlier, the authors visualised a medio-lateral movement of the ITB at knee flexion, which leads to compression of underlying adipose tissue rather than friction of the ITB. This supports the idea that the pathoanatomical site of injury is more likely to be associated with adipose tissue compression beneath the tract, rather than a pathological alteration of the ITB itself [15].

The underlying aetiology of ITBS is likely multifactorial. External factors such as weekly mileage, short experience of running [3], hill running [5,16], improper training [1,6,8,17] and a sudden increase in running distance per week [1] could contribute to the development of ITBS. Internal factors including tightness of the ITB [6], weak hip abductors [6,8,17] and knee flexors/extensors, reduced maximum braking power, decreased subtalar inversion at heel strike [3], increased knee flexion [18], fatigue and decreased knee flexion angle [5], are also described as possible causal mechanisms.

Several authors have evaluated treatment procedure for ITBS. An exercise program for strengthening of the hip abductors and stretching of the ITB has shown positive results in terms of strength and reduced pain in patients with ITBS [6,19]. Stretching of the ITB [6,8,19–23], deep transverse frictional massage (DTFM) [23, 24] and cortisone injections [4,20,22,23] are advised as part of treatment procedure. These can be matched with rest, ice, NSAID's, modification of training activity and running gait re-training [4,6,20,22,23,25,26]. Fredericson & Weir and Khaund & Flynn suggest that myofascial restrictions along the lateral aspect of the hip and thigh should be examined and treated for any trigger points, muscle tension and fascial adhesions [8,17]. Also, massage of the ITB, trigger point therapy of the piriformis, quadratus lumborum and gluteus medius muscles to increase the range of motion of the hip has been suggested [21].

An alternative, not yet explored treatment strategy of ITBS is radial shockwave therapy (RSWT). RSWT is considered safe [27,29,30] as it results in minor adverse effects including worsening of symptoms over a short period of time, reversible local swelling, redness and hematoma [28]. RSWT has also shown to be effective in the treatment of several chronic musculoskeletal pain conditions such as lateral epicondylitis [27,31], achilles tendinopathy [28,32,33], plantar fasciitis [30], patellar tendinopathy [34], calcific ten-

dinitis of the shoulder [35,36] and chronic proximal hamstring tendinopathy [29].

While the exact mechanism by which RSWT operate is still not known [37–39], shockwave treatment is believed to stimulate healing of soft tissue and to inhibit nociceptors [39]. Thus, RSWT increases the diffusion of cytokines across vessel walls into the painful area and stimulates the tendon healing response [40]. Further, results from animal studies show that shockwaves reduce the non-myelinated sensory nerve fibers and significantly reduce Calcitonin gene related peptide (CGRP), and substance-P release [41,42]. Finally, shockwave treatment may stimulate neo-vascularisation in the tendon-bone and bone junction, thus promoting healing [43–45]. It is plausible that shockwaves reduce pain through hyperstimulating pain relief, increased blood flow and tissue regeneration [38].

Although several conservative treatment options have been proposed, there is an obvious paucity of research on the management of ITBS in runners [46]. Consequently, the aim of this study was to compare two treatment protocols; RSWT and manual therapy (ManT) in treating ITBS in runners.

2. Materials and methods

2.1. Subjects

The study was designed as a randomised controlled clinical trial. Male and female runners aged 18–50 with unilateral pain (> 4 weeks) on the lateral aspect of the knee during running were considered as potential subjects. All subjects were recreational runners, and were either self-referred to the clinic or recruited from advertisement in the local media. Diagnosis of ITBS was based on history, a full clinical examination and special clinical tests, including a modified treadmill test. To be included in the study, ITBS had to be diagnosed separately by both authors. The following baseline characteristics were obtained and self-reported from the subjects in written form: age, weight, height and duration of symptoms. As part of history, potential subjects were also questioned about pain localisation, previous knee injuries, injury mechanism and degree of pain.

Degree of pain was used to define the study population and assessed by grading the pain experienced during running as follows [23]: grade 1 – pain after running but not restricting the distance or the speed of running; grade 2 – pain during the run but not restricting

0	No pain
1	
2	Mild pain
3	
4	
5	Moderate pain
6	
7	
8	Severe pain
9	
10	Unbearable pain

Fig. 1. 11-point numeric pain rating scale. Re-drawn from Gunter and Schwellnus [4].

the distance or the speed of running; grade 3 – pain during the run and severe enough to restrict distance or speed; and grade 4 – pain severe enough to prevent running. In order to proceed with baseline evaluation, subjects had to report a pain grade of 3 or 4.

Subjects met the inclusion criteria if they reported localised pain on the lateral femoral condyle on palpation, a positive Noble's test, and a positive treadmill test. Noble's test was considered positive if pain was experienced at 30–40 degrees of flexion when a finger was held on the lateral condyle of the knee during flexion/extension [1]. A goniometer was used to ensure the correct angle of the knee joint.

The treadmill test, based on Schwellnus et al. and Gunter and Schwellnus, was modified to fit existing conditions [4,23]. The test is described as a valid, effective, and sensitive method of evaluating the effects of treatments for running related pain and was used to measure the amount of pain that subjects experienced during normal running [4]. If the subject reported pain to the lateral side of the knee, the test was considered positive.

A warm-up period of 90 seconds preceded the treadmill test. During this phase, subjects walked at 6 km/h. An 11-point numeric pain rating scale (NPRS) was selected as an outcome and used during the test to measure pain experienced during running (Fig. 1). A chart with the NPRS was made easily accessible on the wall in front of the treadmill. Subjects were instructed to report the severity of the typical pain on the lateral side of the knee at the site of ITBS at the end of every minute of the test.

After the warm-up period the speed was increased to match the subject's self-reported running speed. This

speed was maintained for 30 minutes or until the pain reached 8 (severe pain) on the NPRS. The test was then terminated. The selected speed was replicated at each visit. The test was performed with a 0 degree incline and subjects used their own running shoes.

Exclusion criteria were pain not severe enough to impair running performance (grade 1 or 2), signs or symptoms of other pathologies of the knee, previous treatment for ITBS in the last 6 months, use of NSAID's or analgesics later than two weeks before baseline, use of cold or heat packs, stretching or weight lifting later than two days from baseline, previous surgery on the affected knee, pregnancy, thrombopathy, pacemaker, receiving anticoagulants, bone fracture of the affected leg in the last 12 months, previous shockwave treatment, infection, tumor, diabetes mellitus, rheumatic disease, severe cardiac disease, psychiatric disease, other severe systemic diseases and unwillingness to accept either of the interventions in the study.

Eighty-five runners were evaluated for eligibility. After evaluation, 30 subjects were assessed. Six runners were excluded at baseline. Two of these were excluded due to suspicion of other knee injuries as observed during the clinical examination. Another two were excluded due to a negative Noble's test and the last two reported no pain during the treadmill test. In the end, a total of 24 subjects (males $n = 14$, females $n = 10$) were included.

After final selection and baseline assessment subjects were allocated to either treatment by computer-generated block randomisation in blocks of 10. A blind assessor generated the randomisation scheme with use of the web site www.randomization.com, and sealed the numbers in opaque envelopes. A person not involved in the treatments opened the sealed envelopes and assigned subjects according to allocation schedule (Fig. 2). Blinding to treatment assignment was not possible at any point during the study.

Approval of the study was obtained from the local ethics committee in Uppsala, Sweden (Number 2011/418).

A written informed consent was obtained before the baseline evaluation.

2.1.1. Interventions

All interventions was initiated by a Noble's test followed by the treadmill test to monitor any changes in total pain experienced during running. The treatments were provided by two manual therapists with the profession of naprapathy. Naprapath is a registered

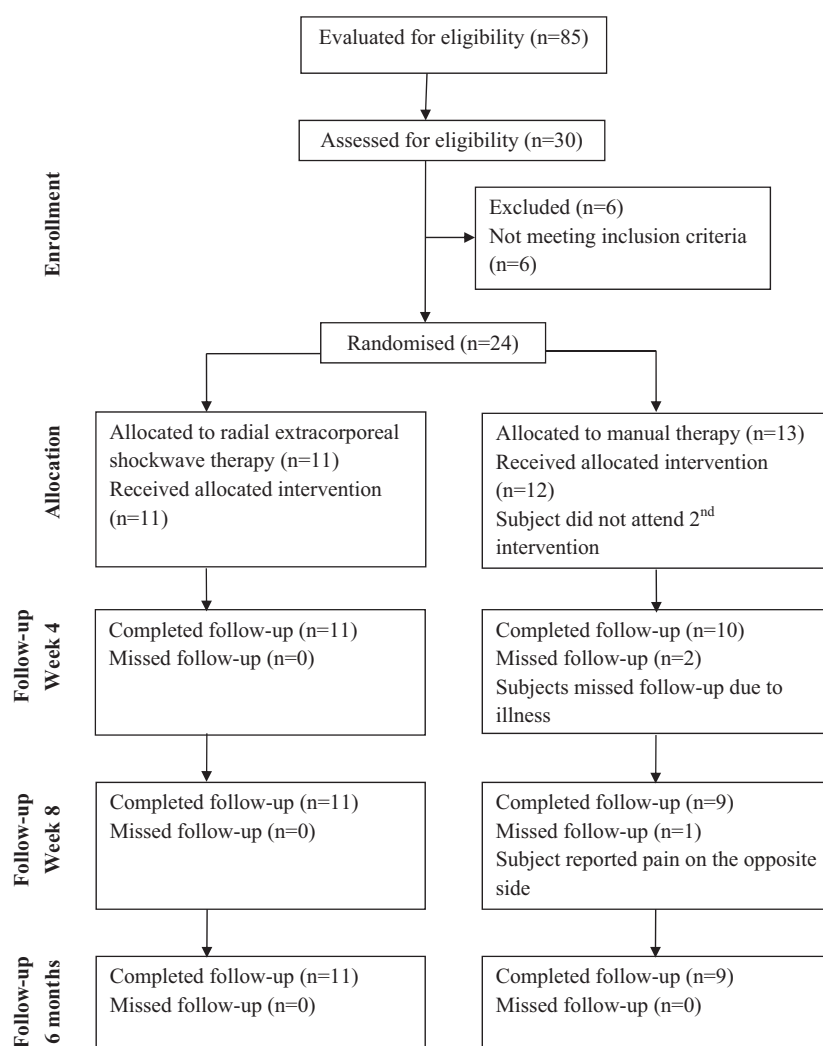


Fig. 2. Flow chart of study.

health profession in Sweden and practiced mainly in the Nordic countries. Both therapists had a minimum of 3 years of experience in manual treatment. Within each group, the interventions were administered by the same investigator.

2.1.2. Shockwave therapy

A radial shockwave device (Storz Medical MP100, Tägerwil, Switzerland) was used. The treatment uses energy shockwaves generated when a projectile in a handpiece is accelerated by pressurised air and hits a 15-mm-diameter metal applicator [32]. The energy is then transmitted from the applicator via ultrasound gel to the skin, where the shockwave disperses radially into the tissue to be treated.

Subjects received 3 treatments of RSWT at weekly intervals. Treatment procedure was initiated by palpation to locate the painful area around the lateral femoral condyle and the lateral side of the thigh. The therapist used the principle of clinical focusing where the subject guides the therapist to the most painful area. The area was treated in a circumferential pattern, starting at the point of maximum pain. At each of the treatments a total of 4600 pulses were applied.

RSWT started with 500 pulses at 0.10 mJ/mm^2 (2 Bar) with the frequency of 15 Hz to the lateral femoral condyle to adjust to treatment. An additional 2000 pulses were applied at 0.10 mJ/mm^2 – 0.4 mJ/mm^2 (2–4 Bar), 15 Hz, depending on pain tolerance. Lastly, 3 trigger points in the lateral thigh were treated with 700 pulses each at 0.10 mJ/mm^2 – 0.4 mJ/mm^2 (2–4 Bar),

15 Hz. Points were identified by palpation through a subject oriented biofeedback process. The subject was placed in a side-lying position with the affected leg upwards and the knee in 30 degrees of flexion for the full treatment procedure.

No local anesthetic was applied as the direct pain-inhibitory effect can be limited [41,44,47]. In addition, SWT without local anesthesia has been proven to be more effective than SWT with local anesthesia [48].

2.1.3. Manual therapy

In the ManT group, subjects also received 3 treatments at weekly intervals. Treatment procedure was initiated by massage of the ITB in a proximal to distal direction. The therapist aimed to obtain a constant pressure throughout the stroke. The procedure was repeated for a total of 30 repetitions. DTFM was applied at the point of maximal pain at the lateral femoral condyle for a total of 10 minutes.

Subsequently, trigger point therapy through ischemic compression [49] was applied for the 3 most painful points on the lateral thigh. Points were identified through a subject oriented biofeedback process. The therapist aimed to obtain a constant pressure with the help of a trigger point stick and the subject's pain tolerance dictated the degree of pressure applied. It was then maintained until pain decreased, whereby the therapist increased pressure for a total of 3 minutes per trigger point. The subject was placed in a side-lying position with the affected leg upwards and the knee in 30 degrees of flexion for the full treatment procedure.

2.1.4. Exercise programme

The exercise programme used in this study was the same for all subjects regardless of intervention group. The exercises were carried out in a home setting and were not supervised. However, all strength and stretching exercises were taught and reassessed during each visit. To monitor and promote adherence to the exercise programme, subjects recorded their daily exercises in a weekly activity log. The activity log was administered at the end of each treatment session. Subjects were informed that if they failed to comply with the program at more than two occasions in one week or if they neglected more than 5 sessions during 4 weeks, they would be excluded from the study.

The exercise programme included 3 strength exercises: side-lying hip abduction exercise, pelvic lift exercise and forward lunges. Table 1 summarises the weekly progression of these exercises. The side-lying abduction exercise was a gluteus medius dynamic con-

Table 1
Summary of the weekly progression of exercises

Exercise	Week	#Sets	# Reps	Hold
Side lying hip abduction	Week 1	1	10/side	5 sec
	Week 2	2	8/side	5 sec
	Week 3	2	12/side	5 sec
	Week 4	3	10/side	5 sec
Hip extension	Week 1	1	10	5 sec
	Week 2	2	8	5 sec
	Week 3	2	12	5 sec
	Week 4	3	10	5 sec
Inline lunges	Week 1		~	~
	Week 2		~	~
	Week 3	1	8/side	~
	Week 4	2	8/side	~

Reps = Repetitions.

traction up to 60 degrees of abduction. Instructions were given to keep the lower knee slightly flexed, lock the upper knee and the upper hip in neutral rotation and 0 degrees of extension. For the pelvic lift exercise, subjects were instructed to contract the core and gluteal musculature before extending the hip, aiming to attain a neutral position. Each repetition ended with a static component of 5 seconds for the two exercises. Finally, forward lunges were introduced by the third week of exercise. Subjects were told to keep a neutral posture and to maintain a knee-over-foot position throughout the lunge. One repetition was considered when subjects had lunged forward with both legs. The exercise programme also involved a standing ITB stretch as described by Fredericson et al. [6]. The stretch was maintained for 60 seconds per leg and conducted twice daily during the entire programme. All strength and stretch exercises were performed for 6 consecutive days, followed by one day off.

Subjects were instructed to report any adverse effects following treatment or exercise in the activity log. They were also informed to stop running or exercising if the activity caused pain. Subjects reporting pain on the treadmill test at week 4 were instructed to continue with the 4-week exercise programme until week 8 and were again informed to avoid running and all other pain-provoking activities.

If reporting a pain-free treadmill test, subjects received no treatment and were allowed a gradual return to running with the advice to avoid hill running and interval training for the first two weeks. Regardless however, the exercise programme had to be carried out for the full 4 weeks.

2.2. Outcome measures

Subjects were followed up at 3 occasions: after 4 weeks, 8 weeks and 6 months. At the first two visits,

the Noble's test and the treadmill test were repeated.

At 6 months the subjects were contacted by telephone by a blinded assessor. If the subjects were pain-free at week 8, they were asked if they had experienced any symptoms of recurrence. However, if pain was present at week 8, they were asked whether they were experiencing any remaining symptoms of ITBS.

Total pain experienced during treadmill running was selected as the primary outcome measure. The secondary outcome measures were defined as the proportion of subjects performing a pain-free treadmill test at week 4 and 8, and as the proportion of pain-free subjects at the 6-month follow-up.

2.3. Statistical analyses

The two groups were compared with respect to the following general baseline characteristics: gender, age, weight, height, body mass index (BMI) and duration of symptoms.

A graph of pain (NPRS units) on the y-axis (1–10) was plotted against time run (minutes) on the x-axis for each of the 5 treadmill tests for any subject. The area under the pain versus time curve was calculated as a measurement of total pain experienced during running. If the pain was severe (score of 8) and the test had to be terminated, the area of the pain versus time for that subject was calculated using the maximum pain score of 8 for the remainder of the test (until 30 minutes) [4]. Mean group pain during running was compared between the SWT and ManT groups at baseline, week 1, week 2, week 4 and week 8.

A two-way ANOVA (factors group and time) was used to analyse if difference between interventions existed. To follow up the interaction between group and time, a paired, one-tailed t-test was used to establish mean differences (MD) from baseline to week 4 and week 8 for each intervention group. An unpaired, two-tailed t-test welch corrected with different sample sizes across the two groups was used to detect MD between groups. It was also used to construct confidence intervals (CI) for each mean and for the difference between the means. Missing responses (3 of 13 in ManT group at week 4, 4 of 13 at week 8), were classified as missing at random and imputed as listwise deletion. The level of significance was established as $p < 0.05$.

3. Results

A total of 24 subjects were randomly assigned to either intervention (Fig. 2). The baseline characteristics

were similar with regard to gender, age, height, weight and BMI. However, they were not similar with regards to duration of symptoms (Table 2).

There were no subjects lost to either intervention or follow-up in the SWT group. One subject did not complete the second intervention in the ManT group. Two failed to attend the follow-up at week 4 due to illness. One subject failed to perform the treadmill test at week 8 due to development of ITBS on the opposite leg. However, the subject reported no pain on the affected leg. One subject in the SWT group and two subjects in the ManT group received two treatments only, due to no pain on the treadmill test at week 2.

Adherence to the exercise programme was good, based on the activity logs. All subjects complied with the activity log protocol. All but one subject developed ITBS during running. Cycling was the other reason for injury.

3.1. Total pain during running

There was no group $\times$ time interaction in pain ($p = 0.864$). However, there was a main effect of time ($p < 0.0005$), as both groups reported an overall reduction in pain. A significant decrease in total pain (51%) was experienced by subjects in the SWT group in the period from baseline to week 4 ($p = 0.022$, MD: 47, 95% CI: 2–93), and from baseline to week 8 (75%) ($p = 0.004$, MD: 69, 95% CI: 22–115). The ManT group showed a tendency for reduced pain (61%) from baseline to week 4 ($p = 0.059$, MD: 39, 95% CI: –12–90), and from baseline to week 8 (56%) ($p = 0.067$, MD: 28, 95% CI: –11–68). Figure 3 shows the relative (%) change in pain perceived in the groups during the 30-minute treadmill running test at each visit.

Pain at baseline did not differ significantly between groups ($p = 0.401$, MD: –21, 95% CI: –72–30).

When comparing MD of decrease in pain between the SWT group and the ManT group, no significant difference was found neither from baseline to week 4 ($p = 0.796$, MD: –8, 95% CI: –72–56), nor from baseline to week 8 ($p = 0.155$, MD: –40, 95% CI: –97–17).

In the SWT group, 6 of 11 (55%) subjects reported a pain-free treadmill test at week 4 and week 8. In the ManT group, the numbers were 7 of 10 (70%) and 4 of 9 (44%), respectively.

All pain-free subjects at week 8 remained pain-free at 6 months. 7 of 11 (64%) subjects in the SWT group and 6 of 9 (67%) subjects in the ManT group reported a pain-free activity level when contacted by telephone

Table 2
Physical characteristics and duration of symptoms. Values are mean $\pm$ standard deviation

	SWT group ($n = 11$)	ManT group ($n = 13$)	p-value
Age (years)	32 (10)	34 (6)	0.62
Height (cm)	172 (9)	174 (7)	0.65
Weight (kg)	69 (12)	69 (9)	0.98
BMI	23.1 (3.0)	22.7 (2.0)	0.73
Duration of symptoms (months)	60.4 (53.7)	42.3 (65.1)	0.48

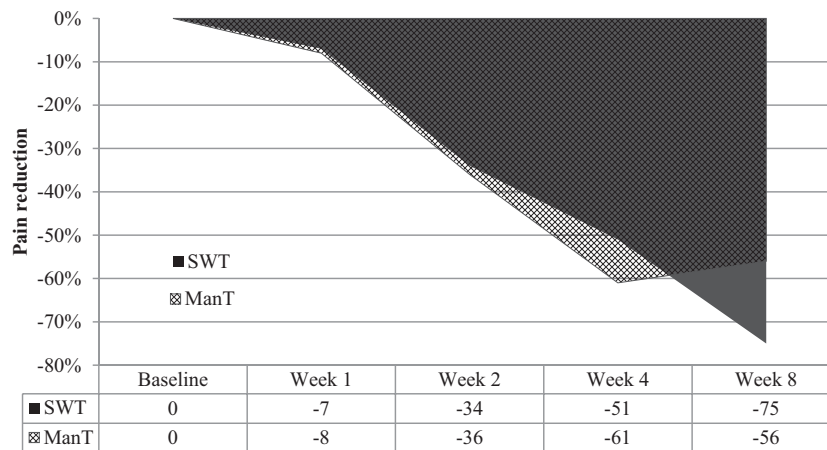


Fig. 3. Relative (%) change in pain reduction during running. Values are mean.

by the blinded assessor. These numbers include all subjects who completed a pain-free treadmill test at week 8 with the addition of one subject in the SWT group and two subjects in the ManT group who previously reported pain at week 8.

3.2. Adverse effects

There were no serious complications. Transient redening of the skin occurred after shockwave treatment in all subjects in the SWT group. A small number of subjects in the ManT group reported transient bruising on the lateral thigh following trigger point therapy.

4. Discussion

The aim in this study was to compare the efficacy of two intervention protocols for treating ITBS; RSWT versus ManT. The fact that both groups showed a comparable drop in pain levels, indicate that both treatment strategies are equally effective.

Both groups consistently reported an overall reduction in pain. At week 4, 55% of the subjects in the SWT group and 70% in the ManT group reported a pain-free treadmill test and were allowed a careful return

to running. The pain levels had dropped significantly for the SWT group at week 4 and 8, and the ManT group approached significance. The manual techniques applied in the ManT group have been shown effective in several studies [8,17,21,23,24], and RSWT appears to be effective in treating many chronic musculoskeletal pain conditions [27–36]. Accordingly, it seems that RSWT and ManT may be of benefit to a rehabilitation programme for ITBS and both interventions should be considered as additional treatment options for the treating clinician.

It was evident that the positive results were sustained for 6 months. Subjects experiencing no pain at week 8 remained symptom-free after 6 months. At the same time, one additional subject from the SWT group and two other subjects from the ManT group were categorised as pain-free, suggesting both interventions may be promising in the long term. However, at 6 months we only assessed whether the subjects were experiencing symptoms based on their current activity level, and the treadmill test was not used. Hence, we do not know if the subjects still include running as a part of their physical activity.

When comparing groups, we did not detect any significant differences between groups neither from baseline to week 4 nor from baseline to week 8. Thus, we

cannot recommend one treatment option over the other. Fredericson et al. previously showed that a hip abductor strengthening programme can reduce pain and improve strength in runners with ITBS [6]. On the contrary, soft tissue therapy such as massage and trigger point therapy may aid to decrease muscle stiffness and to improve function [9]. More recently, case reports have demonstrated reduced pain with running gait re-training as the primary intervention [25,26]. Several different treatment options seem to be beneficial in the management of ITBS. It appears, therefore, that runners with ITBS are likely to benefit from a comprehensive rehabilitation programme including not only ManT and RSWT with the concurrent exercise programme, but also interventions targeting neuromuscular control, lower limb muscle strength, load management, running re-training, and other internal and external components. Only when these plausibly limiting factors have been thoroughly assessed and identified, the clinician is able to formulate a rehabilitation plan specifically customised for the injured runner.

The energy supplied at each RSWT treatment was individualised. The intensity of pulses was determined using subject-oriented feedback and maintained slightly below maximum pain level. We followed the SWT management protocol described by Rompe et al. regarding application of pulses, patient guidance, no anesthesia and weekly intervals [32]. In overuse injuries such as achilles tendinopathy, plantar fasciitis, calcific tendinitis of the shoulder and patellar tendinopathy the vast majority of papers are in favour of SWT, yet controversy still exist on the effect of SWT as a treatment procedure [50]. This can in part be explained by the prevailing application methods. Efficacy may be dependent upon machine types, differences in methodology, independent energy levels and total energy measurements [50]. In this study, an alternative treatment strategy including RSWT is proposed. However, the most beneficial strategy of total energy levels, applications of pulses and treatment intervals for optimal pain outcomes is yet to be evaluated. Additional studies should be directed toward addressing this paucity in methodology and to establish a standardised treatment protocol of RSWT for ITBS.

Some limitations need to be taken into account when interpreting the results. When comparing baseline characteristics between groups, the duration of symptoms was greater in the SWT group. This could have influenced the results, since musculoskeletal conditions may demand a long period of treatment and rehabilitation before responding to treatment.

Further, pain is recognised as a subjective experience within a multidimensional, biopsychosocial framework [51]. Therefore, we cannot exclude social, genetic or psychological variables such as beliefs or emotions influencing treatment outcome, leaving us with potential unmeasured confounders.

Also, we did not include a group without treatment. We found it difficult to justify this considering the previously observed effects on rehabilitation management for ITBS [6]. Finally, a potential selection bias cannot be ruled out, since a total of 4 subjects were lost from baseline to week 8 in the ManT group.

Lastly, it could be argued that the slight difference between groups could be of practical significance. Thus, future studies should include even more subjects to provide sufficient power to detect subtle, yet possibly important, differences between treatments. Also, the evidence to support a specific approach to the management of ITBS is still limited, and no clinical trials have investigated the benefit of different conservative treatment options in isolation [46]. Future studies should address this gap of knowledge.

5. Conclusions

This study showed no difference in effect on pain reduction between RSWT and ManT. Nevertheless, pain was reduced in both treatment groups. Further studies are needed to address whether RSWT and ManT alone or concurrent with other types of rehabilitation strategies, are effective in treating this injury.

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