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Nonsurgical treatment options for insertional Achilles tendinopathy

Dilger CP, BS[1], **Chimenti RL, DPT,PhD**[1,*]

[1]University of Iowa, Department of Physical Therapy and Rehabilitation Science

Abstract

The majority of non-operative treatments for IAT have insufficient evidence to support treatment recommendations, with exercise and ESWT as notable exceptions. Exercise has the highest level of evidence supporting the ability of this treatment option to reduce IAT pain (Grade A recommendation). The effects of exercise may be enhanced by the use of a wide variety of other treatments, including soft tissue treatment, nutritional supplements, iontophoresis, education, stretching, and heel lifts (Grade I recommendation). When exercise is unsuccessful, ESWT appears to be the next best non-operative treatment option to reduce IAT pain (Grade B recommendation). After other non-operative treatment options have been exhausted, injections may be considered particularly as a means to facilitate participation in an exercise program (Grade I recommendation).

Keywords

(5–8)Eccentric Exercise; Rehabilitation; Physical therapy; Extracorporeal shock wave therapy; Achilles tendonitis; Pain

Introduction

Non-operative care is a first line approach for treating insertional Achilles tendinopathy (IAT). While surgical procedures for IAT have long differed from those done for midportion Achilles tendinopathy (AT), this disease-specific approach is relatively new in the field of rehabilitation. For example, the Alfredson eccentric exercise protocol published in 1998 was long considered the gold standard non-operative treatment for AT.[1] It was not until 2008 that a modified version of this exercise protocol was published with a modification to better target care for patients with IAT.[2] In the last decade there has been a greater emphasis on understanding the pain mechanisms and response to treatment in people with IAT rather than considering the midportion and insertional AT diagnoses as a single patient population. While patients with chronic IAT have traditionally not done as well with non-operative treatment compared to patients with midportion AT, there is the potential for this patient population to have better outcomes with non-operative care now that disease-specific treatments are being designed and tested.

[*]Corresponding author: ruth-chimenti@uiowa.edu, Phone: 319-335-7013, Address: University of Iowa, 2116 Westlawn, Iowa City, IA 52245.

The purposes of this review are to provide grades of recommendation for non-operative treatments of IAT as well as estimates of the treatment effect size on IAT pain. While other symptoms associated with IAT, e.g. stiffness, and level of disability, e.g. limitations in walking distance, are valuable in understanding the effect of an intervention on an individual this review has focused on pain since it was assessed in nearly all of the reviewed studies and facilitated comparisons between treatments. The levels of evidence and grades of recommendation are consistent with standards set by other reviews on the treatment of AT (Tables 1 and 2).[3–5] The PEDro scores from the Physiotherapy Evidence Database were used when available to define a "high quality" RCT (score ≥ 6/10) when available.

Exercise: *Grade B Treatment Recommendation*

Exercise is the primary treatment strategy for all patients with IAT, yet the ideal parameters (type, dose, combination with additional treatments) of exercise are still unknown. In this review the evidence for eccentric exercise has been grouped by one parameter related to the range of motion through which the exercise is performed, including 1) to end-range ankle dorsiflexion, and 2) with reduced range of ankle dorsiflexion. In addition to eccentric exercise, physical therapists also use heavy slow-resistance training and isometric exercise, which have been shown to provide pain relief for other types of tendinopathy.[6,7] Eccentric exercise has long been considered the "gold standard" for exercise interventions for tendinopathy, and testing of these other types of exercise has not yet been translated to the IAT population.

Eccentric, full range of ankle dorsiflexion

The standard eccentric exercise protocol utilizing full range of ankle dorsiflexion motion does have some therapeutic benefit with an average decrease of 1.8 to 2.8 in pain ratings on an 11-point scale at 3 to 4 month follow-up (Level I,II, & III evidence).[8–10] Yet after completing this type of exercise program, on average pain persisted at a rating of 2 to 5.[8–10] Moreover, there is a high rate of non-responders to eccentric exercise with end range dorsiflexion with 70% of participants reporting poor results (Level IV evidence).[11]

Eccentric, reduced range of motion

Eccentric exercise can be modified for patients with IAT by reducing the range of motion during the exercise. By reducing the amount of ankle dorsiflexion, this modification reduces the amount of compression on the soft tissues at the tendon insertion[12] and, based on clinical experience, also reduces the level of pain reported during the exercise. With a modified eccentric exercise protocol, pain has been shown to decrease from 5.4 at baseline to 3.0 at 3 months and 1.0 by 1 year (Level II evidence, n=16).[13] Similarly, a case series of patients with IAT reported a relatively high rate of patient satisfaction with 67% able to resume their pre-injury level of activity.[2] In summary, all studies demonstrate a decrease in pain with eccentric exercise, yet this effect may be greatest when the exercise is modified for the IAT population.

Extracorporeal shock wave therapy: *Grade B Treatment Recommendation*

Extracorporeal shock wave therapy (ESWT) is commonly used after patients have not responded well to other non-operative treatments, such as eccentric exercise or injections.[9,14–17] Use of ESWT is an emerging research with four Level IV studies published since 2016 supporting the use of this treatment for IAT.[14–17] Yet it should be noted that some studies exclude patients with enthesophytes or Haglund's deformity, and so these positive findings may not be generalizable to all patients with IAT.[9,16]

Among non-responders to other non-operative treatments, including exercise, an RCT by Rompe and colleagues[9] found that ESWT was more effective at reducing pain than full range eccentric exercise program (Eccentric group: 6.8 to 5.0, ESWT: 7.0 to 3.0; Level I evidence). Yet even though the ESWT group had a 2-point greater decrease in pain compared to the eccentric exercise group, it should be noted that at 4 months the ESWT group still reported a load-induced pain level of 3.0.[9] Several other clinical trials (Level II and III) have demonstrated similar results with ≥ 2-point decrease in pain with ESWT, yet maintain a final pain level of 3 to 5 at short-term and long-term follow-up.[18–20]

Supplemental non-operative treatments: *Grade I treatment recommendation*

There are a variety of other non-operative treatment options that are used in combination with other treatments, and are therefore difficult to assess the effectiveness individually. The addition of soft tissue treatment with Astym to an eccentric exercise program resulted in reduced pain at 3 month and 1 year follow-up, but the soft tissue treatment did not provide significantly more pain relief (Table 3).[13] Similarly, the addition of arginine supplementation with other nutraceuticals to ESWT had no difference at 2-month outcomes, but did have a slightly greater decrease in pain at 6-month follow-up (Table 4).[18] Particularly for patients with concomitant retrocalcaneal bursitis or paratendonitis, other common adjuncts to therapy include, non-steroidal anti-inflammatory medications, iontophoresis,[21] and ice. Education on how to modify activities to increase activity level while minimizing aggravation of IAT symptoms may be beneficial.[22]

Weighing the need for stretching versus the need for heel lifts ultimately depends on the needs and preferences of the patient. On the one hand there is some biomechanical evidence to suggest that activities that require greater ankle dorsiflexion increases both tendon elongation (tensile strain) and compression (compressive strain) at the tendon insertion.[12,23] Therefore clinicians often recommend use of a heel lift, particularly during higher level activities. Exercise treatments that require end-range dorsiflexion may aggravate IAT symptoms for many patients and contribute to the lower rates of 30% to 50% patients satisfaction with, respectively, eccentric exercise into end-range dorsiflexion or use of stretching alone (Level IV evidence).[11,24] On the other hand, particularly for patients with limited ankle dorsiflexion, stretching may be a beneficial part of the intervention. Weight-bearing stretches and night splints have been used in combination with other treatments as standard of care and have resulted in decreased pain at long-term follow-up (Table 3).[8]

Injections: *Grade I treatment recommendation*

There are a variety of injections offered for IAT, yet none have sufficient levels of evidence to support a treatment recommendation. There is a consensus to avoid corticosteroid injections for treatment of tendinopathy due to concern about contributing to further tendon degeneration and potential tear.[25] Yet, particularly for patients with IAT who have concomitant retrocalcaneal bursitis, the use of a corticosteroid injection may be considered as a supplement to care for those who are initially non-responders to an exercise intervention (Level IV evidence).[26] Another option for patients who have failed other non-operative treatment options is sclerosing therapy with polidocanol to target neovascularization (Level IV evidence).[27] Finally PRP injections have been shown to reduce pain in some patients with chronic IAT following extensive use of other non-operative treatments (Level IV evidence).[15,28]

Summary

The majority of non-operative treatments for IAT have insufficient evidence to support treatment recommendations, with exercise and ESWT as notable exceptions (Table 2). Exercise has the highest level of evidence supporting the ability of this treatment option to reduce IAT pain (Grade A recommendation). The effects of exercise may be enhanced by the use of a wide variety of other treatments, including soft tissue treatment, nutritional supplements, iontophoresis, education, stretching, and heel lifts (Grade I recommendation). When exercise is unsuccessful, ESWT appears to be the next best non-operative treatment option to reduce IAT pain (Grade B recommendation). After other non-operative treatment options have been exhausted, injections may be considered particularly as a means to facilitate participation in an exercise program (Grade I recommendation).

Limitations of this review article are linked to limitations in reported outcome measures. This review has focused on pain, since it is often the primary outcome measure of research studies. However, certain treatments may be more effective for other symptoms, such as stiffness, or disability, which this review has not captured. Also, in our summary of results we assumed that all studies had participants rate activity- or load-related pain at the Achilles tendon insertion, however this was often not specified within research articles. In addition to intensity, the context (e.g. during activity versus at rest), location, and duration are all components of the sensory-discriminative aspect of pain and are each needed to interpret the clinical significance of a change in pain. Finally, this review only provides a grade of recommendation for two non-operative treatments; more research is needed to provide evidence-based recommendations for IAT.

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Key Points (3–5)

- Exercise is a first line treatment strategy for all patients with insertional Achilles tendinopathy (Grade A recommendation).
- When exercise is unsuccessful, ESWT is the next best non-operative treatment option to reduce IAT pain (Grade B recommendation).
- There are a variety of other non-operative treatment options that can be used either to enhance the effects of exercise and ESWT or to try prior to surgical intervention, yet there is currently little evidence to support their efficacy

TABLE 1.

Levels of Evidence and Grades of Recommendation

Levels of Evidence (given to individual studies)
Level I: High-quality randomized clinical trial (RCT) or systematic review
Level II: Prospective comparative study, Lesser quality RCT or systematic review
Level III: Retrospective or case-control study
Level IV: Case series or case study
Level V: Expert opinion
Grades of Recommendation (given to treatment options)
Grade A: Treatment option is supported by **strong** evidence (consistent with a preponderance of Level I and/or II studies)
Grade B: Treatment option is supported by **moderate** evidence (consistent with a single Level I study or a preponderance of Level II studies)
Grade C: Treatment option is supported by **weak** evidence (single level II study, or a preponderance of level III and IV studies)
Grade I: **Insufficient** evidence exists to make a treatment recommendation

TABLE 2.

Summary of Grades of Recommendation for Treatment Options

Non-Operative	
Exercise	Grade A
Extracorporeal shock wave therapy	Grade B
Soft tissue treatment	Grade I
Nutritional supplement	Grade I
Iontophoresis	Grade I
Education	Grade I
Stretching	Grade I
Heel lifts	Grade I
Injections	Grade I

TABLE 3

. Levels of evidence (LoE) supporting Grade A treatment recommendation of exercise for insertional Achilles tendinopathy (IAT). The effect on pain is reported on a 0 to 10 scale, unless otherwise noted, as Mean ± SD or Mean (95% CI). NR, not reported.

LoE, Study design	IAT sample	Intervention	Findings	Effect on Pain	Author, year
Eccentric Exercise, end range dorsiflexion					
Level I, RCT PEDro= 8/10	N=50	Eccentric exercise, end range dorsiflexion (n=25) vs. ESWT (n=25, Also in Table 4)	- Both groups had decreased pain relative to baseline - ESWT had greater decrease in pain than eccentric exercise	Eccentric exercise Baseline: 6.8 ± 1.0 4m: 5.0 ± 2.3 ESWT Baseline: 7.0 ± 0.8 4m: 3.0 ± 2.3	Rompe, Furia, & Maffulli, 2008
Level I, RCT PEDro= 7/10	N=36	Eccentric, end range dorsiflexion, plus standard care (n=16) vs. standard care (stretching, ice, heel lifts, night splint) (n=20)	- Both groups had decreased pain relative to baseline. - No differences in pain between groups	Eccentric exercise Baseline: 4.6 ± NR 3m: 2.4 ± 2.0 Standard care Baseline: 3.6 ± NR 3m: 1.5 ± 2.2	Kedia et al., 2014
Level IV, Case series	N=30	Eccentric exercise, end range dorsiflexion	- One third of participants (n=10) had decrease in pain relative to baseline - Pain on 0 to 100 scale	Responders Baseline: 68.3 ± 7.0 3m: 13.3 ± 13.2 Non-responders Baseline: 79.5 ± 11.2 3m: 75.4 ± 11.2	Fahlstrom, Jonsson, Lorentzon, & Alfredson, 2003
Level IV, Case series	N=10	Eccentric exercise, end range dorsiflexion	- Pain decreased relative to baseline	Baseline: 6 ± 2.5 3m: 3.2 ± 2.7	Knobloch, 2007
Eccentric Exercise, reduced range dorsiflexion					
Level I, RCT PEDro= 7/10	N=16	Eccentric exercise, reduced range dorsiflexion (n=9) vs. Eccentric exercise (Ex) plus Astym soft tissue treatment (n=7)	- Both groups had decreased pain relative to baseline. - No differences in pain between groups	Exercise Baseline: 5.4 (3.6 to 7.2) 3 m: 3.0 (1.5 to 4.4) 1 yr: 1.0 (0.0 to 2.6) Astym+ Ex Baseline: 4.6 (2.8 to 6.4) 3m: 1.7 (0.8 to 2.8) 1yr: 0.7 (0.0 to 1.9)	McCormack, Underwood, Slaven, & Cappaert, 2016
Level IV, Case series	N=27	Eccentric exercise, reduced range of ankle dorsiflexion	- Two thirds of participants (n=18) had decrease in pain relative to baseline - Pain on 0 to 100 scale	Responders Baseline: 69.9 ± 18.9 3m: 21.0 ± 20.6 Non-responders Baseline: 77.5 ± 8.6 3m: 58.1 ± 14.8	Jonsson et al., 2008

Table 4.

Levels of evidence (LoE) supporting Grade B treatment recommendation of Extracorporeal Shock Wave Therapy (ESWT) for insertional Achilles tendinopathy (IAT). The effect on pain is reported on a 0 to 10 scale, unless otherwise noted, as Mean ± SD or Mean (95% CI)

LoE, Study design	IAT sample	Intervention	Findings	Effect on Pain	Author, year
Level I, RCT PEDro= 8/10	N=50	ESWT (n=25) vs. Eccentrics exercise, full range of ankle dorsiflexion (n=25, Also in Table 3)	- Both groups had decreased pain relative to baseline - ESWT had greater decrease in pain than eccentric exercise	ESWT Baseline: 7.0 ± 0.8 4m: 3.0 ± 2.3 Eccentric Baseline: 6.8 ± 1.0 4m: 5.0 ± 2.3	Rompe, Furia, & Maffulli, 2008
Level II, RCT PEDro= 5/10	N=64	ESWT (n=32) vs ESWT with nutraceuticals (n=32, Also see Table 5)	- Both groups had decreased pain relative to baseline - ESWT with nutraceuticals had greater decrease in pain than ESWT alone	ESWT Baseline: 7.0 ± 1.3 2m: 4.5 ± 3.0 6m: 2.9 ± 2.3 ESWT+ Baseline: 7.1 ± 1.7 Nutracueticals 2m: 4.5 ± 3.0 6m: 2.0 ± 1.8	Notarnicola, 2012
Level II, RCT PEDro= 4/10	N= 60	ESWT (n= 30) vs. Cold Air and High Energy Laser Therapy (CHELT) (n=30)	- Both groups had decreased pain relative to baseline - Cold Air and High Energy Laser Therapy had greater decrease in pain than ESWT	ESWT Baseline: 7.0 ± 1.2 6m: 3.3 ± 1.0 CHELT Baseline: 7.0 ± 1.0 6m: 1.7 ± 1.0	Notarnicola et al, 2013
Level III, Case-control study	N=68	ESWT (n=35) vs. Control: non-operative management (n=33)	- ESWT group had decrease in pain relative to baseline - Control group did NOT have decrease in pain relative to baseline	ESWT Baseline: 7.9 ± 2.0 3m: 2.9 ± 2.1 12m: 2.8 ± 2.0 Control Baseline: 8.6 ± 1.1 3m: 7.2 ± 1.3 12m: 7.0 ± 1.4	Furia, 2006
Level IV, Case series	N=67	ESWT	-Decrease in pain relative to baseline	Baseline: 3.9/6 ± 0.8 15m (± 7m): 2.1/6 ± 0.8	Wu, 2016
Level IV, Case series	N=45	ESWT (n=24) and PRP (n=21, see Table 5)	-Decrease in pain relative to baseline	ESWT Baseline: 6.4 ± 1.3 4m: 2.5 ± 2.3 6m: 1.5 ± 2.1 PRP Baseline: 5.9 ± 1.0 4m: 3.0 ± 1.9 6m: 2.6 ± 1.9	Erroi et al., 2017
Level IV, Case series	N=40	ESWT and eccentric exercise	-Decrease in pain relative to baseline	Baseline: 7.6 ± 0.6 6m: 2.8 ± 0.7 12 m: 1.9 ± 1.2	Pavone, 2016
Level IV, Case series	N=12	ESWT	-Decrease in pain relative to baseline	Baseline: 6.7 (0 to 10) 4m: 4.4 (1 to 8) 2 yr: 2.8 (0 to 10)	Taylor, 2016