The Comparative Effectiveness of Treatment Options for Plantar Heel Pain: A Systematic Review with Network Meta-Analysis

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ABSTRACT

Objective: To evaluate the comparative effectiveness of current treatment options for plantar heel pain (PHP).

Design: Systematic review and network meta-analysis (NMA).

Data Sources: Medline, EMBASE, CINAHL, AMED, PEDro, Cochrane Database, Web of Science, and WHO Clinical Trials Platform were searched from their inception until January 2018.

Study selection: Randomised controlled trials (RCTs) of adults with PHP investigating common treatments (i.e. corticosteroid injection, nonsteroidal anti-inflammatory drugs (NSAIDs), therapeutic exercise, orthoses and/or extracorporeal shockwave therapy (ESWT)) compared with each other or a no treatment, placebo/sham control.

Data extraction and analysis: Data were extracted and checked for accuracy and completeness by pairs of reviewers. Primary outcomes were pain and function. Comparative treatment effects were analysed by random effects network meta-analysis in the short, medium, and long term. Relative ranking of treatments was assessed by surface under the cumulative ranking (SUCRA) probabilities (0-100 scale).

Results: Thirty-one RCTs (total n= 2450 patients) were included. There was no evidence of inconsistency detected between direct and indirect treatment comparisons in the networks, but sparse data led to frequently wide confidence intervals. Available evidence does not suggest that any of the commonly used treatments for the management of PHP are better than any other, although corticosteroid injections, alone or in combination with exercise, and ESWT were ranked most likely to be effective for the management of short, medium and long term pain or function; Placebo/sham/control appeared least likely to be effective; and exercise appeared to only be beneficial for long term pain or function.

Conclusions: Current evidence is equivocal regarding which treatment is the most effective for the management of PHP. Given limited understanding of long-term effects, there is need for large, methodologically robust multicentre RCTs investigating and directly comparing commonly used treatments for the management of PHP.

Systematic review registration: PROSPERO CRD42016046963.

Highlights

What is already known about the management of plantar heel pain

- Existing pairwise meta-analyses are limited to comparisons of two or three treatment options for plantar heel pain.
- Clinical decision making regarding the best treatment option is often difficult.

What this study adds

- For the management of plantar heel pain, available evidence does not support the superiority of any of the commonly available treatments over another.
- However, corticosteroid injections, alone or in combination with exercise, and ESWT appear more likely to be effective for relieving plantar heel pain and improving function compared to other treatments in the short, medium and long term.
- Control treatments (which include over the counter pain medications and watchful waiting, as well as placebo interventions) generally show less beneficial effects than other treatments for patients with plantar heel pain.
- The review highlights the need for large high-quality RCTs of the commonly used interventions for the management of plantar heel pain.

INTRODUCTION

Plantar heel pain (PHP) is the most prevalent soft tissue foot complaint, affecting 10% of adults during their lifetime[1] and accounting for 25% of all foot disorders in athletes.[2] Characterised by insidious onset, localised pain in the plantar heel region which may extend to the medial arch of the foot, the cause of PHP is unclear but is likely multifactorial. Risk factors include obesity, pronated foot type, reduced ankle or first metatarsophalangeal joint range of motion, and prolonged weight-bearing.[3-5] PHP reduces mobility, impairs foot and physical function and the capacity for work, all of which have a negative impact on health-related quality of life.[1 6 7]

In terms of primary care management, current guidance suggests a period of watchful waiting with self-management advice followed by conservative interventions if there is no improvement, including; therapist-led exercises, foot orthoses, corticosteroid injections, and extracorporeal shockwave therapy (ESWT).[8-10] Although PHP is commonly thought to be a self-limiting condition, resolution of symptoms in some patients may take up to 18 months.[11] Research to date suggests treatments do offer potential benefits in terms of reduced pain and improved function,[1] but clinical decision-making is hampered due to a lack of robust evidence to inform the choice of treatment.

A Cochrane systematic review[12] considered a range of interventions (including exercises, foot orthoses, corticosteroid injections, ESWT, laser therapy and therapeutic ultrasound) for PHP, but was not able to pool the available data, found inconclusive evidence for the effectiveness of treatments and overall, found limited evidence to inform clinical practice. Since the publication of this review, a number of additional randomised controlled trials (RCTs) have been conducted, of which the evidence has yet to be synthesised. A recent review[13] of conservative treatments for PHP included many interventions (e.g., laser therapy, orthoses, pulsed radiofrequency, dry-needling) which are not commonly used for managing PHP, and analyses were limited by lack of power (2-3 studies, mostly small sample sizes) except for the ESWT vs. placebo comparison. Also, other previous systematic reviews[10 12 14-16] have focussed mostly on pair-wise comparisons of two or three treatment options.

Day to day clinical decision making, however, often involves consideration of the "most effective" among available treatment options for plantar heel pain. Network meta-analysis (NMA) as a novel synthesis of evidence allows for simultaneous inferences regarding clinical effectiveness of all available treatment options, by drawing together evidence from direct and indirect comparisons of multiple treatments.[17] Compared to traditional pairwise comparisons, NMA has the potential to increase the precision of the estimates of effects. Also, NMA enables a ranking of the different treatments relative to each other and aids clinical/shared decision making for clinicians and patients who may desire to know the "best treatment" on average.[17]

There is a need therefore, to undertake a comprehensive, up to date systematic review of the comparative effectiveness of treatment options for PHP. Using a network meta-analysis, this study aimed to evaluate and compare the most common conservative treatment options for the management of PHP.

The specific objectives of this study were to:

i. determine the comparative effectiveness of treatments for relieving pain and improving function in patients with PHP
ii. identify gaps in the available evidence, as well as identify promising treatments that require investigation in future RCTs.

METHODS

Protocol / protocol registration: This review was conducted and reported in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) extension statement for systematic reviews incorporating network meta-analyses for healthcare.[18] An a priori protocol was established for this review and registered with the international prospective register of systematic reviews, PROSPERO number CRD42016046963 (http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42016046963).

Patient involvement: Patient involvement was central to the development of the research question. Within an advisory workshop which included participants who currently have or have experienced PHP (n=6) and clinicians (n=12; physiotherapists and podiatrists) involved in the management of foot pain, patients discussed their experiences of PHP and their concerns about the need to determine effective treatment options for relieving symptoms and improving function (i.e. pain free walking).

Study eligibility: We evaluated each identified RCT against the following predetermined selection criteria:

(i) *Study population*: adults, 18 years and older with PHP (including plantar fasciitis, plantar fasciopathy, plantar fasciosis) as diagnosed by clinical examination and/or diagnostic imaging.

(ii) *Interventions:* The review focussed on four therapeutic interventions (i.e. exercise therapy, corticosteroid injections, nonsteroidal anti-inflammatory drugs (NSAIDs), and orthoses) that are commonly used in the management of PHP in the UK[19] and an additional treatment (i.e. ESWT) which is commonly reported in the literature.

Due to an envisaged lack of suitable data on dosage and procedural variations of treatment options, this systematic review and NMA focussed primarily on comparisons of the specified core therapeutic interventions (exercise therapy, corticosteroid injections, orthoses, NSAIDs, and ESWT).

(iii) *Comparator:* direct comparisons between any of the five core therapeutic interventions (i.e. exercise therapy, corticosteroid injections, NSAIDs, orthoses, and ESWT) or comparisons with usual care/placebo/sham for PHP in any healthcare setting (community, primary healthcare, or secondary healthcare), and without restrictions regarding duration, frequency or intensity of treatment. Studies only comparing different procedural techniques of the same intervention (e.g. focal vs radial shockwave) were excluded.

(iv) *Outcome measure:* the primary outcomes for this review were pain and functional disability. In order to be eligible for inclusion, assessment of pain and /or functional disability was required, studies with less than 24 hours follow up were excluded. Pain measures were placed in a hierarchy as follows: first step pain, pain in the morning, pain on activity (e.g. walking), overall pain (or other measures of pain). This hierarchy was used to analyse the most clinically relevant data when multiple pain outcomes were reported in a RCT.

Information sources and search strategy: A comprehensive search strategy was developed in collaboration with an information specialist, with input from clinicians and academics in the review team. Eight electronic databases (Medline, EMBASE, CINAHL, AMED, PEDro, Cochrane Database of Systematic Reviews Cochrane Controlled Clinical Trials [CENTRAL], Web of Science, and WHO International Clinical Trials Registry Platform) were searched from their inception until January 2018 (see Appendix 1 for full search strategies). No language restrictions were applied. The bibliographies of relevant review articles and selected articles were examined for additional potentially relevant trials.

Study selection: In pairs, reviewers (OB, AL, CL, LSC, MJT, DvdW, ER) independently evaluated the eligibility of identified trials. At each stage of titles, abstracts and full texts selection, discrepancies were resolved through discussion between pairs of reviewers or via consensus in review team meetings.

Risk of bias assessment: The Cochrane Collaboration's Risk of Bias tool[20] was used to assess the quality of included trials. Trials were graded (unclear, high or low risk of bias) based on: (i) sequence generation, (ii) allocation concealment, (iii) blinding of personnel, (iv) blinding of outcome assessor, (v) incomplete outcome data, (vi) selective outcome reporting, and (vii) other bias. For each study, risk of bias items was judged as unclear when there was either insufficient information to judge as (low/high risk) or there was no related information regarding the risk of bias item in the report (further details on risk of bias assessment are presented in Appendix 1).

Data extraction: Using a customised, pre-tested and piloted data extraction form, risk of bias and data extraction for each included trial were performed by pairs of reviewers. Differences in quality appraisal and extracted data were resolved through discussion between pairs of reviewers and where appropriate, the opinion of other members of the review team. For each included trial, details were extracted on: design, sample size, population characteristics (e.g. age, diagnosis, duration of heel pain, interventions (professional delivering intervention, dose, duration, and number of sessions), and outcome assessment (type of outcome measure, length of follow up, and outcome measurements). Studies that provided a point estimate of the outcome together with a measure of variability (e.g. a mean and standard deviation), were taken forward for analysis. Where only sample size, median, range and/or interquartile range was given, methodology from Wan et al[21] was used to calculate the sample mean and standard deviation. In instances of missing or incomplete data (for example, lack of measures of variability for follow up data), additional information was requested and obtained (where possible) through contacting primary study authors.

Data synthesis and analysis

All analyses were performed using STATA V.15.1 (Stata Corporation, TX, USA), under a frequentist approach, with restricted maximum likelihood used to estimate parameters. Prior to analyses, extracted data were further checked independently for completion and accuracy by the study statistician while profiling a database for the analyses. Furthermore, in order to define the treatment nodes for the network; two reviewers (HBM and ER), a podiatrist and rheumatologist, independently reviewed and classified the therapeutic interventions following a consensus process. As the objective of this systematic review was to compare different treatment options, and not to investigate the influence of dosage or intensity of interventions, the specified core therapeutic interventions

(exercise therapy, corticosteroid injections, orthoses, NSAIDs, and ESWT), and usual care/placebo/sham, were allocated to six distinct nodes. Furthermore, studies involving combination(s) of any of the specified core treatments were used in our analyses in addition to the six nodes as treatment nodes with combination treatments. For example, where trial arms have involved a combination of exercise therapy and a corticosteroid injection as an intervention, corticosteroid injection + exercise was classed as a distinct treatment node. Also, where RCTs included more than one arm with the same type of treatment, the data was pooled together (e.g. for a three-armed trial[22] involving a prefabricated orthoses arm, and two custom orthoses arms (differentiated by a rigid and soft material), an average of the mean outcomes and standard deviations was taken from the custom orthoses arms, and a sum taken from the arm sample sizes, in order to create a single pooled orthoses arm).
In order to obtain direct treatment effect estimates (with a 95% confidence interval [CI]) for each included comparison pairwise meta-analyses were performed. Direct and indirect estimates of effects were then analysed together in a NMA.

Network coherence (consistency and heterogeneity): The important assumption underlying a NMA is that of network consistency; that is, true treatment effects are on average the same, regardless of whether they are estimated from direct or indirect evidence. This was assessed in three ways: (i) using a global Wald test (with high p-values favouring consistency);[23] (ii) using a node-splitting technique which judges the consistency of direct and indirect estimates separately for each treatment comparison (with high p-values favouring consistency);[24] and (iii) graphically (as a crude test), by inspection of forest plots comparing direct and pooled NMA results. Furthermore, the choice of a random or fixed effects model for each analysis was based on the magnitude of τ^2 (i.e. the common between-study variance across all treatment comparisons). A structured between-studies variance-covariance matrix was used, which assumes that all treatment comparisons have a common heterogeneity variance.

Primary outcomes of pain and function were classified as: (i) short term (1 to ≤ 6 weeks post treatment), (ii) medium term (6 to ≤ 12 weeks post treatment), or (iii) long term (> 12 weeks post treatment). For short and medium term outcomes, the latest outcome data within each time-category was used for analysis. For example, if a study reported 3 and 6-week pain outcomes, only the 6-week data were used. However, because the long term category has no upper bound, a different approach was taken to reduce potential heterogeneity in results; we evaluated the spread of long term outcomes and selected the most prevalent time-point, and only retained data matching this time point for analysis. A total of six NMAs were possible (pain or function outcomes analysed separately for each time-category), and a network plot was used to graphically present the direct evidence base and assess connectedness of each network.

Assessing comparative effectiveness of treatments: The principal summary measure used for pain and function outcomes was the standardised mean difference (SMD). SMDs are advantageous in homogenising outcomes from different scales and instruments onto a common scale. The direction of outcome scales in the raw data were reversed where appropriate (by multiplying values by -1), to ensure all outcomes were interpreted with lower values indicative of improvements in pain or functional disability. Estimates of effects (SMDs) were interpreted according to Cohen's rule of thumb, with values of 0.2, 0.5, and 0.8 indicative of small, moderate, and large effects, respectively[25]. Direct pairwise (where available) and pooled NMA estimates, along with 95% CIs, are

reported for all treatment comparisons. SMDs with 95% CIs that did not include the null value (of SMD=0, i.e. no difference in comparative treatment effect), were classed as statistically significant.

Ranking of treatments: To further assess the comparative effectiveness of treatments, the ranking probability distributions of each treatment were generated from a simulation of 1000 replications. We used mean rank, surface under cumulative ranking curve (SUCRA) values, and cumulative ranking plots. These statistics rank treatments according to their ability to generate the largest treatment effects in each simulation, and are averaged over the 1000 replications.

Sensitivity analysis: To assess the robustness of the findings for pain and functional outcomes, sensitivity analysis based on risk of bias was planned but not performed. This was due to most studies showing similar (unclear) risks of bias. Sensitivity analysis by the removal of studies with unclear risk led to insufficient data to support the network.

RESULTS

Characteristics of included studies: The literature search yielded 1400 unique citations, of which 263 full-text articles were selected for full review. The study flow chart is presented in Fig.1. Of the 263 full text articles, 59 met the inclusion criteria and were subjected to quality assessment and data extraction. A further 28 articles could not be included in the network meta-analysis due to: being duplicate reports of the same RCT (n=1); examining dose regimen/technique comparisons of the same intervention (n=9); examining a similar but different treatment to commonly used interventions for PHP i.e., intracorporeal pneumatic shock therapy (n=1); and data/reporting problems where authors could not be contacted or failed to respond to queries after repeated attempts over a 3 month period (n= 17). Summary of findings and the characteristics of eligible studies that could not be incorporated into the meta-analysis are presented in Appendix 2 (Tables 1 & 2).

Thirty-one RCTs involving 2450 participants across ten different (combinations of) interventions (ESWT, ESWT + exercise, ESWT + orthoses, exercise, NSAID injection + exercise, oral NSAIDs, orthoses, corticosteroid injection, corticosteroid injection + exercise, and placebo/sham) provided sufficient data for inclusion in the NMA. Table 1 (Appendix 1) presents the characteristics of the included RCTs. RCTs were published between 1999 and 2017. The maximum length of follow up ranged from 4 weeks to 104 weeks. Most RCTs were from Europe (n=8), followed by Asia (n=6) and Australia (n=5). RCTs recruited participants mostly from primary care sources and outpatient departments of hospitals and rehabilitation centres and investigated a combination of participants with duration of PHP symptoms ranging from 10 to 287 weeks.

Risk of bias in the evidence base

The risk of bias assessment for the 31 included trials is presented in Fig.2a and 2b. All included studies were RCTs, however a significant proportion (35%) did not adequately report how randomisation was performed. High risk of bias was considered present most frequently (in 26% of trials) in relation to lack of blinding of participants and personnel. Many of the trial outcomes were patient reported but outcome assessment procedures were reported as blinded in 45% of the trials. The reporting of most of the trials did not provide sufficient information to

accurately assess concealment of treatment allocation, thus generating a large proportion of "unclear" responses (61% of trials). Overall, fourteen [22 26-38] of the 31 trials were considered to be of low quality with fewer than 50% of risk of bias items (i.e. ≤ 3/7) classed as low risk.

Network coherence (consistency and heterogeneity)

NMA was possible for all (six) connected networks of evidence, which investigated pain and function outcomes separately, with follow-ups at: (i) short term, (ii) medium term, and (iii) long term. There were no signs of the consistency assumption being violated for any network (where applicable; i.e. only considering closed loop networks). Firstly, the global Wald tests for inconsistency were not significant (p = 0.822, 0.971, and 0.925 for short term pain, medium term pain, and short term function, respectively). Secondly, no statistically significant difference was observed between direct and indirect estimates when assessed separately for each treatment comparison through a node-splitting technique (all p values were >0.05). Thirdly, the 95% confidence intervals of the network and pairwise meta-analysis summary results overlapped for all three closed loop networks (Fig.1S). The heterogeneity term, τ^2, was 'moderate' to 'large' in magnitude (as classed by Cohen's rule of thumb[25]) for all of the networks except long term function (Appendix 1, Table 2). Hence, random effects analyses were used for all but the long term function network (whereby fixed effects analyses were used). Full raw outcome data used (including outcome scales) are provided in Appendix 1, Table 3.

Treatments for PHP: Pain outcomes

Evidence base: There were 22 studies[22 26-28 30 31 33 37 39-53] (21x two-arm, 1x 3-arm) in the short term pain evidence base, with a similar sized network of 23 studies[27-32 34 37 39-42 44-47 49-56] (22x two-arm, 1x 3-arm) in the medium term, and a smaller network of 10 studies[29 34-38 40 44 45 49 55] (all two-arm) in the long term; as presented in Fig.3. Eight different treatment nodes were used in the short term analysis, with these same treatments and the addition of a ninth (ESWT+ exercise) used in the medium term, and eight treatments in the long term. Placebo/sham-ESWT comparisons were most prevalent across all pain outcome networks (n=6 studies in short and medium term, n=4 in long term), and the number of participants ranged from 31 (NSAID injection + exercise in long term) to 574 (ESWT in medium term). Direct evidence was available for 12 out of a possible 28 pairwise comparisons in the short term, 12/36 in the medium term, and 7/28 in the long term. Outcome follow up ranged from 2-6 weeks in the short term (n=1,744 total participants used), 2-3 months in the medium term (n=2,018), and was fixed at 12 months for the long term (n=778).

Comparative effectiveness of treatments: Full pairwise and network analyses results for pain are presented in Table 1. Across both pairwise and network analyses, corticosteroid injection demonstrated a statistically significant larger reduction in short term pain over oral NSAIDs (SMD 2.60, 95% CI (0.81, 4.39)); and corticosteroid injection combined with exercise showed a statistically significant larger reduction in pain compared to exercise alone (SMD 1.20, 95% CI (0.14, 2.26)). Compared to other treatments, oral NSAIDs were most often associated with the least statistically significantly reductions in short term pain (by SMD 2.25, 95% CI (0.18, 4.33) compared to orthoses, and by SMD 2.61, 95% CI (0.13, 5.09) compared to corticosteroid injection combined with exercise).

Most treatments were not statistically significantly superior to one another and underlying estimates of effect presented with very wide confidence intervals. For instance, the network comparison of ESWT combined with orthoses showed a non-statistically significant reduction in medium term pain compared to ESWT in combination with exercise (SMD=2.36, 95% CI, (-2.17, 6.89)).

With the highest SUCRA values of 79.5 and 74.4, and the best mean ranks of 2.4 and 2.8, corticosteroid injection alone and in combination with exercise ranked amongst the three most effective treatments for short term pain, 82.7% and 65.7% of the time, respectively (Fig.4A, Table 2). In contrast, oral NSAIDs (which ranked amongst the three least effective treatments 97.3% of the time), exercise alone, and placebo/sham interventions demonstrated the least comparative effectiveness for pain relief in the short term. General trends from the NMA and direct comparisons for medium term pain indicated that ESWT combined with orthoses may be more effective than other treatments (highest SUCRA value of 80.3; Fig 4B, Table 2). Oral NSAIDs, exercise, and exercise combined with ESWT were least likely to have beneficial effects for the treatment of pain due to PHP in the medium term compared to other treatments. Whilst placebo and orthoses appeared least likely to be beneficial for long term pain (85.7% and 81.0% of the time ranking amongst three least effective treatments respectively; Fig 4C, Table 2), superiority of one treatment over another for the remaining six treatments was less clear, with most of these treatments having similar rankings (average SUCRA of 60.8).

Treatments for PHP: Function outcomes

Evidence base: For function outcomes, there were fewer RCTs available for analysis compared to the pain (14 studies were in the network for short term function[26 30 33 37 39 41-46 48 49 52-53], 11 for medium term[30 37 41 42 44-46 49 52-53 55], and 5 for long term [35 37 44 45 49 55]; all two-armed), as shown in Fig.5. Similar treatment nodes were used across the networks, with the same six used in short and medium term function analyses (ESWT, ESWT + exercise, orthoses, placebo, corticosteroid injection with and without exercise), whilst the long term analysis did not contain corticosteroid without exercise. Placebo/sham-ESWT comparisons were most common in the short (n=4 studies) and long term (n=2 studies), whilst ESWT/corticosteroid injection and corticosteroid injection with exercise/exercise alone comparisons (n=3 studies) were joint most common for medium term. The number of participants ranged from 20 (exercise in long term) to 226 (ESWT in short term), and direct evidence was available for 7 out of a possible 15, 5/15, and 4/10 comparisons, in the short, medium and long term, respectively. Outcome follow up ranged from 2-6 weeks in the short term (n=868 total participants used), 2.5-3 months in the medium term (n=811), and was fixed at 12 months for the long term (n=312).

Comparative effectiveness of treatments: The comparative effectiveness of treatments (both pairwise and network meta-analyses) on function outcomes are presented in Table 3. As with pain outcomes, most treatments were not significantly better than one another in the short, medium and long term; confidence intervals were often wide. Placebo/sham interventions were comparatively worse at improving functional ability than other treatments; for example, network meta-analysis showed statistically significant reductions in long term functional ability (by SMD 0.93, 95% CI (0.23, 1.63) compared to corticosteroid injection, by SMD 1.09, 95% CI (0.15, 2.03) compared to exercise, and by SMD 0.95, 95% CI (0.50, 1.40) compared to ESWT).

In agreement with the analyses on pain outcome treatment effects, placebo/sham interventions ranked least likely to improve function for patients with PHP (SUCRA values: 16.9, 28.1, and 7.3, in the short, medium, and long term respectively; Fig 6 and Table 4), followed by orthoses (SUCRA: 31.8, 42.4, and 19.4, in the short, medium, and long term respectively), and exercise alone (SUCRA: 32.2, 29.9 in the short and medium term respectively). However, exercise appeared most likely to improve functional ability for long term function (SUCRA: 82.1); whilst corticosteroid with and without exercise, and ESWT consistently ranked in the top three treatments most likely to improve functional ability.

Comparison of effectiveness of treatments across pain and function outcomes

Corticosteroid injection with and without exercise, and ESWT interventions appear most likely to have beneficial effects for both pain and function outcomes over all time periods (Fig 7). In contrast, placebo/sham interventions appear least likely to improve either pain or function outcomes across all time periods, whilst exercise appears to have a non-beneficial effect for short and medium term, but a beneficial effect for long term pain and function.

Summary of findings for RCTs without suitable data for NMA

Findings from seventeen RCTs of seven different comparisons and/or treatment combinations, including ESWT vs placebo/sham (n=11), exercise vs ESWT (n=1), and custom vs prefabricated orthosis/placebo/sham (n=3), for which suitable data could not be obtained are presented in Appendix 2, Table 1. For the comparison between ESWT and placebo/sham, with an unclear to high risk of bias across trials, ESWT is reported to be significantly more effective than sham/placebo for reducing pain in two out of three trials in the short term, and four out of seven in the medium term. There was no evidence for the effect of ESWT on function in the short term but two trials reported reduction in functional disability in the medium term. However, there was uncertainty in evidence across trials and time points as shown by very large confidence intervals and inconsistency of the magnitude of effects. For both pain and function outcomes and across time points (short, medium and long-term), trials found no difference between custom and prefabricated orthoses. All other treatment comparisons/combinations contained only one trial with mostly small sample sizes.

DISCUSSION

Available evidence does not suggest that any of the commonly used treatments for the management of PHP are significantly better than any other, although the results of this NMA show that corticosteroid injections alone or in combination with exercise are effective treatments for reducing pain and improving function in the short term. However, the magnitude of estimate of effect varied widely across trials with large confidence intervals. Furthermore, the overall effect of corticosteroid injections on plantar heel pain is modest, and the potential for adverse effects [15 57] such as post-injection steroid-induced increase in pain, fat pad atrophy, nerve injury, and rupture of the plantar fascia require careful consideration. There was a greater amount of evidence for ESWT but we found no evidence that this treatment confers more beneficial effects (compared to the other treatments in this study) for reducing pain and improving function among patients with PHP.

In the network meta-analyses of both pain and function, placebo/sham interventions and NSAIDs were generally shown to be the least effective treatment options. Considering PHP has long been considered to be a self-limiting pain condition, our findings indicate that first line management recommendations of PHP with over the counter pain medications, NSAIDs and a watchful waiting approach may be sub-optimal. Previous literature has suggested that delaying treatment may worsen prognosis, and potentially create a need for further health care use[57]. The findings of this present study supports the notion that access to treatments without a period of watchful waiting may be beneficial.

As the current NMA is the first to examine the comparative effectiveness of the most common treatments for PHP, it is difficult to directly compare the findings of the present study with those of previous NMAs which examined a limited number of treatments[58], or compared dosage/technique for specific treatment options[59]. Previous reviews collectively indicate that exercise and foot orthoses are promising interventions for short and medium-term improvements in pain and function[60 61]. In this review, exercise as a stand-alone treatment was not found to consistently confer beneficial effects in reducing pain and improving function for patients with PHP in the short-term, but a beneficial effect was found for long term pain and function. There is a lack of evidence regarding the most effective exercise dose or delivery method. In this systematic review, included RCTs reported varying exercise therapy protocols, dose and regime. As with the review by Almubarak & Foster[60], exercise as a treatment in this review included stretching and strengthening exercise trials; treatment comparisons including exercise in combination with other treatments such as corticosteroid injection mostly had calf stretching as the 'exercise' component. These exercises were mostly home based (apart from the first session that may be supervised) and were not individualised or progressed. Within the networks, foot orthoses (prefabricated or custom), were not found to be effective as a stand-alone treatment for PHP, but were mostly effective in combination with ESWT. Our findings agree with those of recent systematic reviews showing that foot orthoses are better than sham/placebo and may be effective for reducing pain in the medium term[13 61].

Study strengths and limitations

In this study, direct and indirect evidence has been combined in order to assess comparative effectiveness of interventions that have not yet (or only minimally) been directly compared in robust high quality trials. There was agreement between the direct and indirect evidence which achieved consistency for specified treatments, however tests for inconsistency are likely to be underpowered, due to lack of data, as evidenced by wide 95% CIs for SMDs. As an alternative to frequentist methods which was used in the current NMA, a Bayesian three-level hierarchical NMA model may be employed. This approach has been shown to increase precision of effect estimates in meta-analysis of few trials, or a large number of treatment options which can be further sub-divided[62]. However, this approach was deemed to be out of scope for our NMA which mainly focusses on comparisons across different treatments. Future NMAs, especially those incorporating dose comparisons and procedural variations of the same treatment options, would benefit from Bayesian analysis.

The current study is not without limitations and must be interpreted with caution. First is the inclusion of only the most common treatments as opposed to all available treatments for the management of PHP. This decision was made in order to inform choice of treatment in primary care settings where PHP patients are mostly seen, and to

evaluate interventions that are widely available and accessible to patients. Furthermore, networks would likely be disconnected when including a large number of treatments evaluated in only a small number of trials. The sparsity of data did not allow for a statistical exploration of publication bias, however, we conducted a comprehensive search of published and unpublished literature as well as employed a paired screening process to ensure all available evidence was identified. However, the findings of this review are still likely to be influenced by the small number of trials (mostly with small sample sizes) available to support direct and indirect comparisons in the network. For instance, many nodes in the networks (Fig.3 and Fig.5), were connected by only a single trial and (for some treatments) with few participants.

The loss of data associated with absence of suitable data for analysis was a challenge in this review. Related first, and more importantly, to the disparate reporting of data in scientific reports in this field, a lot of data from otherwise eligible (but excluded trials) could not be analysed mostly due to lack of reporting of treatment outcomes with a mean as well as a measure of variability. Despite concerted efforts to request this additional data from trial authors, the inability of our review to incorporate such data into evidence synthesises inadvertently led to notable research waste. As a minimum, for all trials in this field, reporting an average and a measure of variability (e.g. a mean and a standard deviation) per trial arm for each follow up period should be required. Furthermore, to avoid substantial heterogeneity, data from some trials which used a very different approach to measuring outcomes could not be combined in the network. However, this problem could be overcome through the development of and adherence to an agreed standardised set of core outcomes to be used in trials in this field. In order to minimise the loss of potentially useful evidence, details of all otherwise eligible trials were extracted with a narrative summary of findings presented (Appendix 2, Table 1). Generally, the results from these trials were found to be in agreement with the evidence presented in the network meta-analysis.

Implications for clinical practice, policy and future research

Within the network meta-analysis, control treatments (including placebo/sham interventions, watchful waiting approach, over the counter pain medications), and NSAIDs generally showed lack of beneficial effects for patients with PHP. For primary care first-point-of-contact decision making purposes, our findings suggest that access to treatments may be beneficial for patients with PHP.

However, findings from this review must be interpreted with caution due to limitations in quality of the evidence underpinning the analyses. Of particular concern are predominantly small sample sizes, low quality reporting of aspects of study design (especially concealment of treatment allocation), and variability in outcome measures across included studies (Appendix 1, Table 3). Furthermore, this review cannot comment on evidence for comparative effectiveness of treatment options where the influence of duration of symptoms prior to treatment may be of concern. This is due to the wide variability in the range of duration of symptoms at recruitment across studies included in this review and the fact that most trials did not report data regarding the duration of symptoms per trial arm. Future research involving patients with PHP should therefore focus on the design of large trials with head to head comparisons of active treatments, long term follow-up and higher reporting standards. Furthermore, careful consideration of trials investigating the same treatment comparisons (especially for the most promising

interventions in the short and long term) is an important next step. This will enable exploration of the optimal mode of delivery, dosage, and intensity of treatments required for successful management of PHP.

CONCLUSION

This is the first NMA to examine the comparative effectiveness of commonly used treatments for PHP and brings together available evidence in order to aid evidence-informed clinical decisions in the management of PHP. For pain and functional outcomes, most treatments were not significantly better than others in the short, medium and long term. The comparative effectiveness of commonly used treatments (i.e. exercise therapy, corticosteroid injections, orthoses, NSAIDs, and ESWT) is limited by large variation in magnitude and imprecision of effect estimates. Findings indicate the need for large, multicentre trials directly comparing commonly used treatments for the management of PHP.

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Figure Legend

Figure 1. Study flow chart

Figure 2a. Risk of bias for all individual studies (n=31) included in the analysis.

Figure 2b. Summary of risk of bias across all (n=31) studies included in the analysis.

(Abbreviations: + (green circle), low risk of bias; ? (amber circle), unclear risk of bias; - (red circle), high risk of bias)

Figure 3. Network graph of included studies for pain outcomes, with thickness of lines and size of circles proportional to number of studies and number of participants, respectively. Shown for: A) short term evidence, B) medium term evidence, and C) long term evidence.

NOTE: black text represents number of studies, and blue text number of participants
Treatment abbreviations: ESWT=Extracorporeal shockwave therapy, ESWT+Exe= Extracorporeal shockwave therapy combined with exercise, ESWT+Orthoses= Extracorporeal shockwave therapy combined with orthoses, Exe=exercise, NSAID Inj+Exe=oral nonsteroidal anti-inflammatory drug combined with exercise, Oral NSAID=oral nonsteroidal anti-inflammatory drug, Orthoses=prefabricated or customised foot orthoses, Placebo=usual care/placebo, Steroid Inj=corticosteroid injection, and Steroid Inj+Exe=corticosteroid injection combined with exercise.

Figure 4. Cumulative ranking plots to show comparative effectiveness of treatments from a pain outcome network meta-analysis, for each of: A) short term outcomes, B) medium term outcomes, and C) long term outcomes. Results based on a simulation of 1000 replications.

Treatment abbreviations: ESWT=Extracorporeal shockwave therapy, ESWT+Exe= Extracorporeal shockwave therapy combined with exercise, ESWT+Orthoses= Extracorporeal shockwave therapy combined with orthoses, Exe=exercise, NSAID Inj+Exe=oral nonsteroidal anti-inflammatory drug combined with exercise, Oral NSAID=oral nonsteroidal anti-inflammatory drug, Orthoses=prefabricated or customised foot orthoses, Placebo=usual care/placebo, Steroid Inj=corticosteroid injection, and Steroid Inj+Exe=corticosteroid injection combined with exercise.

Figure 5. Network graph of included studies for function outcomes, with thickness of lines and size of circles proportional to number of studies and number of participants, respectively. Shown for: A) short term evidence, B) medium term evidence, and C) long term evidence.

NOTE: black text represents number of studies, and blue text number of participants
Treatment abbreviations: ESWT=Extracorporeal shockwave therapy, Exe=exercise, Orthoses=prefabricated or customised foot orthoses, Placebo=usual care/placebo, Steroid Inj=corticosteroid injection, and Steroid Inj+Exe=corticosteroid injection combined with exercise.

Figure 6. Cumulative ranking plots to show comparative effectiveness of treatments from a function outcome network meta-analysis, for each of: A) short term outcomes, B) medium term outcomes, and C) long term outcomes. Results based on a simulation of 1000 replications.

Treatment abbreviations: ESWT=Extracorporeal shockwave therapy, Exe=exercise, Orthoses=prefabricated or customised foot orthoses, Placebo=usual care/placebo, Steroid Inj=corticosteroid injection, and Steroid Inj+Exe=corticosteroid injection combined with exercise.

Figure 7. Scatter plots to show comparative effectiveness of treatments*, through surface under cumulative ranking curve (SUCRA) values (0-100), for pain (x-axis) and function (y-axis) outcomes. Shown separately for each of: A) short term outcomes, B) medium term outcomes, and C) long term outcomes. Note: Higher SUCRAs indicate better performing treatments.

Note: horizontal and vertical lines added at SUCRA=50 values as a crude guide to identifying comparatively better/worse performing treatments for pain/function.

Treatment abbreviations: ESWT=Extracorporeal shockwave therapy, Exe=exercise, Orthoses=prefabricated or customised foot orthoses, Placebo=usual care/placebo, Steroid Inj=corticosteroid injection, and Steroid Inj+Exe=corticosteroid injection combined with exercise.
* Note that SUCRA results for four treatments are completely omitted, as data was only available for pain, but not function outcomes (ESWT+Exe= Extracorporeal shockwave therapy combined with exercise, ESWT+Orthoses= Extracorporeal shockwave therapy combined with orthoses, NSAID Inj+Exe=oral nonsteroidal anti-inflammatory drug combined with exercise, and Oral NSAID=oral nonsteroidal anti-inflammatory drug).

Figure 1S. Forest plots showing all direct evidence available, as well as pairwise and network meta-analysis summary estimates, for each of: A) short term pain outcomes, B) medium term pain outcomes, and C) short term function outcomes*.

Note: blue rectangles and lines represent study level SMDs and 95% CIs respectively (with size of rectangle proportional to number of participants), and green and red diamonds represent direct and pooled NMA evidence respectively.

Treatment abbreviations: ESWT=Extracorporeal shockwave therapy, ESWT+Exe= Extracorporeal shockwave therapy combined with exercise, ESWT+Orthoses= Extracorporeal shockwave therapy combined with orthoses, Exe=exercise, Oral NSAID=oral nonsteroidal anti-inflammatory drug, Orthoses=prefabricated or customised foot orthoses, Placebo=usual care/placebo, Steroid Inj=corticosteroid injection, and Steroid Inj+Exe=corticosteroid injection combined with exercise.

* Note: data from long term pain, medium term function and long term function networks not presented, as all three of these networks were open looped, hence direct and pooled NMA evidence were not appropriate to compare.

REFERENCES

1. Landorf KB. Plantar heel pain and plantar fasciitis. *BMJ Clin Evid* 2015:1111.
2. Taunton JE, Ryan MB, Clement DB, McKenzie DC, Lloyd-Smith DR, Zumbo BD. A retrospective case-control analysis of 2002 running injuries. *Br J Sports Med* 2002;36(2):95-101.
3. Riddle DL, Pulisic M, Pidcoe P, Johnson RE. Risk factors for plantar fasciitis: a matched case-control study. *J Bone Joint Surg Am* 2003;85(5):872-77.
4. Rome K, Howe T, Haslock I. Risk factors associated with the development of plantar heel pain in athletes. *The Foot*;11(3):119-25. doi: 10.1054/foot.2001.0698.
5. Irving DB, Cook JL, Menz HB. Factors associated with chronic plantar heel pain: a systematic review. *J Sci Med Sport* 2006;9(1):11-22.
6. Orchard J. Plantar fasciitis. *BMJ (Clinical research ed)* 2012;345 doi: 10.1136/bmj.e6603.
7. Tong KB, Furia J. Economic burden of plantar fasciitis treatment in the United States. *Am J Orthop (Belle Mead NJ)* 2010;39(5):227-31.
8. Map of Medicine. Plantar Fasciitis 2014 [updated 2014. Available from: http://healthguides.mapofmedicine.com/choices/map/plantar_fasciitis1.html. accessed 07/11/2017.
9. Clinical Knowledge Summaries (CKS). Plantar Fasciitis: National Institute for Health and Care Excellence; 2014 [Available from: http://cks.nice.org.uk/plantar-fasciitis. accessed 07/11/2017.
10. Lee SY, McKeon P, Hertel J. Does the use of orthoses improve self-reported pain and function measures in patients with plantar fasciitis? A meta-analysis (Structured abstract). *Phys Ther Sport* 2009;10(1):12-18.
11. Young CC, Rutherford DS, Niedfeldt MW. Treatment of plantar fasciitis. *Am Fam Physician* 2001;63(3):467-74, 77-8.
12. Crawford F, Thomson C. Interventions for treating plantar heel pain. *The Cochrane Database of Sys Rev* 2003;3(3).
13. Salvioli S, Guidi M, Marcotulli G. The effectiveness of conservative, non-pharmacological treatment for plantar heel pain: A systematic review with meta-analysis. *The Foot* 2017; 33:57-67.
14. Hawke F, Burns J, Radford JA, du Toit V. Custom-made foot orthoses for the treatment of foot pain. *Cochrane Database of Syst Rev* 2008; (3). http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD006801.pub2.
15. David JA, Sankarapandian V, Christopher PR, Chatterjee A, Macaden AS. Injected corticosteroids for treating plantar heel pain in adults. *Cochrane Database of Sys Rev* 2017; (6). http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD009348.pub2.
16. Sweeting D, Parish B, Hooper L, Chester R. The effectiveness of manual stretching in the treatment of plantar heel pain: a systematic review. *J. Foot Ankle Res* 2011;4 doi: 10.1186/1757-1146-4-19.
17. Salanti G. Indirect and mixed-treatment comparison, network, or multiple-treatments meta-analysis: many names, many benefits, many concerns for the next generation evidence synthesis tool. *Research synthesis methods* 2012;3(2):80-97.
18. Hutton B, Salanti G, Caldwell DM, et al. The PRISMA Extension Statement for Reporting of Systematic Reviews Incorporating Network Meta-analyses of Health Care Interventions: Checklist and Explanations PRISMA Extension for Network Meta-analysis. *Ann Intern Med* 2015;162(11):777-84.

19. Grieve R, Palmer S. Physiotherapy for plantar fasciitis: a UK-wide survey of current practice. *Physiotherapy* 2017;103(2):193-200. doi: https://doi.org/10.1016/j.physio.2016.02.002.
20. Higgins JP, Altman DG, Gøtzsche PC, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ (Clinical research ed)* 2011;343:d5928.
21. Wan X, Wang W, Liu J, et al. Estimating the sample mean and standard deviation from the sample size, median, range and/or interquartile range. *BMC medical research methodology* 2014;14(1):135.
22. Walther M, Kratschmer B, Verschl J, et al. Effect of different orthotic concepts as first line treatment of plantar fasciitis. *Foot Ankle Surg* 2013;19(2):103-7. doi: 10.1016/j.fas.2012.12.008.
23. White IR, Barrett JK, Jackson D, Higgins JP. Consistency and inconsistency in network meta-analysis: model estimation using multivariate meta-regression. *Res Synth Methods* 2012;3(2):111-25.
24. Dias S, Welton NJ, Caldwell DM, Ades AE. Checking consistency in mixed treatment comparison meta-analysis. *Stat Med* 2010;29(7-8):932-44.
25. Cohen J. Statistical power analysis for the behavioral sciences. Hilsdale. *NJ: Lawrence Earlbaum Associates* 1988.
26. Hawamdeh Z, Alghwiri AA, Nassar A. The short-term effect of extracorporeal shock wave in treating plantar fasciitis: RCT. Jordan Medical Journal 2016;50(1):1-11.
27. Mardani-Kivi M, Karimi MM, Hassanzadeh Z, et al. Treatment Outcomes of Corticosteroid Injection and Extracorporeal Shock Wave Therapy as Two Primary Therapeutic Methods for Acute Plantar Fasciitis: A Prospective Randomized Clinical Trial. *J Foot Ankle Surg* 2015;54(6):1047-52. doi: 10.1053/j.jfas.2015.04.026.
28. Yan W, Sun S, Li X. [Therapeutic effect of extracorporeal shock wave combined with orthopaedic insole on plantar fasciitis]. *Zhong nan da xue xue bao Yi xue ban* 2014;39(12):1326-30. doi: 10.11817/j.issn.1672-7347.2014.12.017.
29. Grecco MV, Brech GC, Greve JM. One-year treatment follow-up of plantar fasciitis: radial shockwaves vs. conventional physiotherapy. *CLINICS* 2013;68(8):1089-95. doi: 10.6061/clinics/2013(08)05.
30. Ryan M, Hartwell J, Fraser S, Newsham-West R, Taunton J. Comparison of a physiotherapy program versus dexamethasone injections for plantar fasciopathy in prolonged standing workers: a randomized clinical trial. *Clin J Sport Med* 2014;24(3):211-7. doi: 10.1097/jsm.0000000000000021.
31. Biswas C, Pal A, Acharya A. A comparative study of efficacy of oral nonsteroidal antiinflammatory agents and locally injectable steroid for the treatment of plantar fasciitis. *Anesth Essays Res* 2011;5(2):158-61. doi: 10.4103/0259-1162.94756.
32. Yucel I, Ozturan KE, Demiraran Y, Degirmenci E, Kaynak G. Comparison of high-dose extracorporeal shockwave therapy and intralesional corticosteroid injection in the treatment of plantar fasciitis. *J Am Podiatr Med Assoc* 2010;100(2):105-10.
33. Chow IH, Cheing GL. Comparison of different energy densities of extracorporeal shock wave therapy (ESWT) for the management of chronic heel pain. *Clin Rehabil* 2007;21(2):131-41. doi: 10.1177/0269215506069244.
34. Porter MD, Shadbolt B. Intralesional corticosteroid injection versus extracorporeal shock wave therapy for plantar fasciopathy. *Clin J Sport Med* 2005;15(3):119-24.

35. Rompe JD, Decking J, Schoellner C, Nafe B. Shock wave application for chronic plantar fasciitis in running athletes. A prospective, randomized, placebo-controlled trial. *Am J Sports Med* 2003;31(2):268-75.
36. Lizis P. Comparison between Real and Placebo Extracorporeal Shockwave Therapy for the Treatment of Chronic Plantar Fasciitis Pain in the Males. *Iranian J Public Health* 2015;44(8):1150.
37. Guevara Serna JA, Acosta Moron JA. *Revista Colombiana de Ortopedia y Traumatologia* 2017 doi: http://dx.doi.org/10.1016/j.rccot.2017.07.004
38. Guner S, Onder H, Guner SI, Ceylan MF, Gökalp MA, Keskin S. Effectiveness of local tenoxicam versus corticosteroid injection for plantar fasciitis treatment. *Orthopedics* 2013;36(10):e1322-6. doi: 10.3928/01477447-20130920-27.
39. Buchbinder R, Ptasznik R, Gordon J, Buchanan J, Prabaharan V, Forbes A. Ultrasound-guided extracorporeal shock wave therapy for plantar fasciitis: a randomized controlled trial. *JAMA* 2002;288(11):1364-72.
40. Haake M, Buch M, Schoellner C, et al. Extracorporeal shock wave therapy for plantar fasciitis: randomised controlled multicentre trial. *BMJ (Clinical research ed)* 2003;327(7406):75. doi: 10.1136/bmj.327.7406.75.
41. McMillan AM, Landorf KB, Gilheany MF, Bird AR, Morrow AD, Menz HB. Ultrasound guided corticosteroid injection for plantar fasciitis: randomised controlled trial. *BMJ* 2012; 344 :e3260. doi: 10.1136/bmj.e3260.
42. Oliveira HA, Jones A, Moreira E, Jennings F, Natour J. Effectiveness of total contact insoles in patients with plantar fasciitis. *J Rheumatology* 2015;42(5):870-8. doi: 10.3899/jrheum.140429.
43. Radford JA, Landorf KB, Buchbinder R, Cook C. Effectiveness of calf muscle stretching for the short-term treatment of plantar heel pain: a randomised trial. *BMC Musculoskeletal Disord* 2007;8:36. doi: 10.1186/1471-2474-8-36.
44. Ibrahim MI, Donatelli RA, Schmitz C, Hellman MA, Buxbaum F. Chronic plantar fasciitis treated with two sessions of radial extracorporeal shock wave therapy. *Foot Ankle Int* 2010;31(5):391-7. doi: 10.3113/fai.2010.0391.
45. Ibrahim MI, Donatelli RA, Hellman M, Hussein AZ, Furia JP, Schmitz C. Long-term results of radial extracorporeal shock wave treatment for chronic plantar fasciopathy: A prospective, randomized, placebo-controlled trial with two years follow-up. *J Ortho Res* 1;35(7):1532-8.
46. Mahindra P, Yamin M, Selhi HS, Singla S, Soni A. Chronic Plantar Fasciitis: Effect of Platelet-Rich Plasma, Corticosteroid, and Placebo. *J Orthopedics* 2016;39(2):e285-9. doi: 10.3928/01477447-20160222-01.
47. Theodore GH, Buch M, Amendola A, Bachmann C, Fleming LL, Zingas C. Extracorporeal shock wave therapy for the treatment of plantar fasciitis. *Foot Ankle Int* 2004;25(5):290-7.
48. Yucel U, Kucuksen S, Cingoz HT, et al. Full-length silicone insoles versus ultrasound-guided corticosteroid injection in the management of plantar fasciitis: a randomized clinical trial. *Prosthet Orthot Int* 2013;37(6):471-6. doi: 10.1177/0309364613478328.
49. Celik D, Kus G, Sirma SO. Joint Mobilization and Stretching Exercise vs Steroid Injection in the Treatment of Plantar Fasciitis: A Randomized Controlled Study. *Foot Ankle Int* 2016;37(2):150-6. doi: 10.1177/1071100715607619.
50. Crawford F, Atkins D, Young P, Edwards J. Steroid injection for heel pain: evidence of short-term effectiveness. A randomized controlled trial. *Rheumatology* 1999;38(10):974-7.

51. Ball EM, McKeeman HM, Patterson C, et al. Steroid injection for inferior heel pain: a randomised controlled trial. *Ann Rheum Dis* 2013;72(6):996-1002. doi: 10.1136/annrheumdis-2012-201508.
52. Hocaoglu S, Vurdem UE, Cebicci MA, et al. Comparative Effectiveness of Radial Extracorporeal Shockwave Therapy and Ultrasound-Guided Local Corticosteroid Injection Treatment for Plantar Fasciitis. *J Am Podiatr Med Assoc* 2017;107(3):192-99. doi: 10.7547/14-114.
53. Eslamian F, Shakouri SK, Jahanjoo F, et al. Extra Corporeal Shock Wave Therapy Versus Local Corticosteroid Injection in the Treatment of Chronic Plantar Fasciitis, a Single Blinded Randomized Clinical Trial. *Pain Med* 2016;17(9):1722-31. doi: 10.1093/pm/pnw113.
54. Kudo P, Dainty K, Clarfield M, Coughlin L, Lavoie P, Lebrun C. Randomized, placebo-controlled, double-blind clinical trial evaluating the treatment of plantar fasciitis with an extracoporeal shockwave therapy (ESWT) device: a North American confirmatory study. *J Ortho Res* 2006;24(2):115-23. doi: 10.1002/jor.20008.
55. Landorf KB, Keenan AM, Herbert RD. Effectiveness of foot orthoses to treat plantar fasciitis: a randomized trial. *Arch Intern Med* 2006;166(12):1305-10. doi: 10.1001/archinte.166.12.1305.
56. Vahdatpour B, Sajadieh S, Bateni V, Karami M, Sajjadieh H. Extracorporeal shock wave therapy in patients with plantar fasciitis. A randomized, placebo-controlled trial with ultrasonographic and subjective outcome assessments. *J Res Med Sci.* 2012;17(9):834-8.
57. Wolgin M, Cook C, Graham C, Mauldin D. Conservative treatment of plantar heel pain: long-term follow-up. *Foot Ankle Int* 1994;15(3):97-102.
58. Hsiao MY, Hung CY, Chang KV, Chien KL, Tu YK, Wang TG. Comparative effectiveness of autologous blood-derived products, shock-wave therapy and corticosteroids for treatment of plantar fasciitis: a network meta-analysis. *Rheumatology* 2015;54(9):1735-43. doi: 10.1093/rheumatology/kev010.
59. Tsikopoulos K, Vasiliadis HS, Mavridis D. Injection therapies for plantar fasciopathy ('plantar fasciitis'): a systematic review and network meta-analysis of 22 randomised controlled trials. *Br J Sports Med* 2016 ;50:1367-1375. doi: 10.1136/bjsports-2015-095437.
60. Almubarak AA, Foster N. Exercise Therapy for Plantar Heel Pain: A Systematic Review. *IJES* 2012;5(3):9.
61. Whittaker GA, Munteanu SE, Menz HB, Tan JM, Rabusin CL, Landorf KB. Foot orthoses for plantar heel pain: a systematic review and meta-analysis. *Br J Sports Med* 2017. doi: 10.1136/bjsports-2016-097355. [published Online First: 2017/09/21].
62. Owen RK, Tincello DG, Keith RA. Network meta-analysis: development of a three-level hierarchical modeling approach incorporating dose-related constraints. *Value in Health* 2015;18(1):116-26.

Table 1. Comparative effectiveness results for pain outcome analyses, for each of: A) short term outcomes, B) medium term outcomes, and C) long term outcomes. Summary estimates from the network meta-analysis are shown in lower left triangle, and summary estimates from pairwise meta-analysis (i.e. direct evidence) in upper right triangle. Each cell shows a standardised mean difference (SMD), with a 95% confidence interval in brackets. For any cell, a negative SMD favours the upper-left intervention, and a positive SMD favours the lower-right intervention. Significant results in bold text.

A

Placebo		0.53 (-0.77,1.83)	0.51 (-0.83,1.86)		0.39 (-1.36,2.13)		0.59 (-0.18,1.35)
0.92 (-0.78,2.62)	**Steroid Inj +Exe**				**-1.20 (-2.26,-0.14)**		
0.91 (0.14,1.68)	-0.01 (-1.73,1.70)	**Steroid Inj**	-0.67 (-2.56,1.22)	**-2.60 (-4.39,-0.81)**	**-1.94 (-3.80,-0.08)**		-0.29 (-1.23,0.65)
0.56 (-0.40,1.52)	-0.36 (-2.26,1.55)	-0.35 (-1.40,0.70)	**Orthoses**			-0.01 (-1.83,1.80)	-0.40 (-2.21,1.42)
-1.69 (-3.64,0.26)	**-2.61 (-5.09,-0.13)**	**-2.60 (-4.39,-0.81)**	**-2.25 (-4.33,-0.18)**	**Oral NSAID**			
-0.28 (-1.62,1.06)	**-1.20 (-2.26,-0.14)**	-1.19 (-2.54,0.16)	-0.84 (-2.43,0.74)	1.41 (-0.83,3.65)	**Exe**		
0.74 (-0.91,2.40)	-0.18 (-2.51,2.16)	-0.16 (-1.87,1.54)	0.18 (-1.42,1.79)	2.43 (-0.04,4.90)	1.03 (-1.06,3.11)	**ESWT +Orthoses**	-0.39 (-2.20,1.43)
0.55 (-0.08,1.19)	-0.37 (-2.12,1.39)	-0.35 (-1.08,0.37)	-0.01 (-1.00,0.99)	**2.24 (0.31,4.17)**	0.84 (-0.57,2.24)	-0.19 (-1.80,1.42)	**ESWT**

B

Placebo		0.46 (-1.62,2.55)	0.30 (-1.75,2.36)					0.54 (-0.67,1.75)
-0.10 (-3.58,3.38)	**Steroid Inj +Exe**				-0.99 (-2.70,0.71)		-1.17 (-4.09,1.75)	
0.37 (-0.92,1.66)	0.47 (-2.77,3.70)	**Steroid Inj**		-2.66 (-5.49,0.17)	-1.53 (-4.41,1.34)			0.14 (-1.18,1.46)
0.58 (-1.08,2.24)	0.68 (-3.11,4.47)	0.21 (-1.77,2.20)	**Orthoses**			0.43 (-2.48,3.33)		-0.67 (-3.57,2.24)
-2.29 (-5.40,0.82)	-2.19 (-6.49,2.11)	-2.66 (-5.49,0.17)	-2.87 (-6.33,0.59)	**Oral NSAID**				
-1.16 (-4.29,1.98)	-1.06 (-2.58,0.46)	-1.53 (-4.39,1.33)	-1.74 (-5.22,1.74)	1.13 (-2.89,5.16)	**Exe**		0.29 (-2.67,3.25)	
1.29 (-1.37,3.95)	1.39 (-2.88,5.65)	0.92 (-1.87,3.71)	0.71 (-1.89,3.30)	3.58 (-0.40,7.55)	2.45 (-1.55,6.44)	**ESWT +Orthoses**		-1.10 (-4.00,1.81)
-1.07 (-4.86,2.72)	-0.97 (-3.11,1.17)	-1.44 (-5.01,2.14)	-1.65 (-5.74,2.43)	1.22 (-3.34,5.78)	0.09 (-2.06,2.24)	-2.36 (-6.89,2.17)	**ESWT +Exe**	
0.47 (-0.53,1.47)	0.57 (-2.85,3.99)	0.10 (-1.01,1.22)	-0.11 (-1.87,1.65)	2.76 (-0.28,5.80)	1.63 (-1.44,4.70)	-0.82 (-3.41,1.78)	1.54 (-2.20,5.28)	**ESWT**

C

Placebo			0.06 (-1.55,1.67)				**1.22 (0.36,2.08)**
1.75 (-1.68,5.19)	**Steroid Inj +Exe**			0.10 (-1.55,1.75)		0.00 (-1.61,1.61)	
1.43 (-0.46,3.32)	-0.32 (-3.20,2.55)	**Steroid Inj**			0.18 (-1.51,1.88)		-0.22 (-1.91,1.48)
0.06 (-1.55,1.67)	-1.69 (-5.49,2.10)	-1.37 (-3.86,1.12)	**Orthoses**				
1.86 (-1.95,5.66)	0.10 (-1.54,1.75)	0.43 (-2.89,3.74)	1.80 (-2.34,5.93)	**NSAID Inj +Exe**			
1.61 (-0.92,4.14)	-0.14 (-2.47,2.19)	0.18 (-1.51,1.87)	1.55 (-1.45,4.55)	-0.25 (-3.10,2.61)	**Exe**	0.15 (-1.54,1.84)	
1.75 (-1.29,4.79)	0.00 (-1.61,1.61)	0.32 (-2.06,2.71)	1.69 (-1.75,5.13)	-0.10 (-2.40,2.20)	0.14 (-1.54,1.83)	**ESWT +Exe**	
1.22 (0.36,2.07)	-0.53 (-3.86,2.80)	-0.21 (-1.90,1.48)	1.16 (-0.67,2.98)	-0.64 (-4.35,3.08)	-0.39 (-2.78,2.00)	-0.54 (-3.45,2.38)	**ESWT**

Treatment abbreviations: ESWT=Extracorporeal shockwave therapy, ESWT+Exe= Extracorporeal shockwave therapy combined with exercise, ESWT+Orthoses= Extracorporeal shockwave therapy combined with orthoses, Exe=exercise, NSAID Inj+Exe=oral nonsteroidal anti-inflammatory drug combined with exercise, Oral NSAID=oral nonsteroidal anti-inflammatory drug, Orthoses=prefabricated or customised foot orthoses, Placebo=usual care/placebo, Steroid Inj=corticosteroid injection, and Steroid Inj+Exe=corticosteroid injection combined with exercise.

Table 2. Network meta-analysis treatment ranking results for pain outcome analyses, for each of: short term outcomes, medium term outcomes, and long term outcomes. Surface under cumulative ranking curve (SUCRA) values (0-100) and mean ranks are presented, based on a simulation with 1000 replications. Note: higher SUCRAs and lower mean ranks indicate better performing treatments.

	Short Term Pain		Medium Term Pain		Long Term Pain	
Treatment	**SUCRA**	**Mean Rank**	**SUCRA**	**Mean Rank**	**SUCRA**	**Mean Rank**
ESWT	60.7	3.8	67.2	3.6	54.5	4.2
ESWT+Exe			29.4	6.6	64.2	3.5
ESWT+Orthoses	66.5	3.3	80.3	2.6		
Exe	24.6	6.3	26.1	6.9	61.4	3.7
NSAID Inj+Exe					63.3	3.6
Oral NSAID	3.7	7.7	13.3	7.9		
Orthoses	60.5	3.8	66.6	3.7	20.0	6.6
Placebo	30.1	5.9	48.7	5.1	15.6	6.9
Steroid Inj	79.5	2.4	63.7	3.9	58.4	3.9
Steroid Inj+Exe	74.4	2.8	54.7	4.6	62.7	3.6

Treatment abbreviations: ESWT=Extracorporeal shockwave therapy, ESWT+Exe= Extracorporeal shockwave therapy combined with exercise, ESWT+Orthoses= Extracorporeal shockwave therapy combined with orthoses, Exe=exercise, NSAID Inj+Exe=oral nonsteroidal anti-inflammatory drug combined with exercise, Oral NSAID=oral nonsteroidal anti-inflammatory drug, Orthoses=prefabricated or customised foot orthoses, Placebo=usual care/placebo, Steroid Inj=corticosteroid injection, and Steroid Inj+Exe=corticosteroid injection combined with exercise.

Table 3. Comparative effectiveness results for function outcome analyses, for each of: A) short term outcomes, B) medium term outcomes, and C) long term outcomes. Summary estimates from the network meta-analysis are shown in lower left triangle, and summary estimates from pairwise meta-analysis (i.e. direct evidence) in upper right triangle. Each cell shows a standardised mean difference (SMD), with a 95% confidence interval in brackets. For any cell, a negative SMD favours the upper-left intervention, and a positive SMD favours the lower-right intervention. Significant results in bold text.

A

Placebo			0.30 (-2.98,3.58)	0.24 (-3.01,3.49)	**1.86 (0.19,3.52)**
1.83 (-1.15,4.80)	**Steroid Inj +Exe**			-1.24 (-3.04,0.56)	
1.98 (0.10,3.87)	0.16 (-2.83,3.14)	**Steroid Inj**	-1.34 (-4.66,1.97)	-1.03 (-4.32,2.26)	-0.46 (-2.34,1.43)
0.47 (-1.91,2.85)	-1.36 (-4.93,2.22)	-1.52 (-3.91,0.88)	**Orthoses**		
0.59 (-1.78,2.96)	-1.24 (-3.03,0.56)	-1.40 (-3.78,0.99)	0.12 (-2.97,3.21)	**Exe**	
1.71 (0.26,3.15)	-0.12 (-3.18,2.95)	-0.28 (-1.87,1.31)	1.24 (-1.25,3.73)	1.12 (-1.36,3.61)	**ESWT**

B

Placebo			0.27 (-1.32,1.86)		0.93 (-0.68,2.53)
1.14 (-2.22,4.51)	**Steroid Inj +Exe**			-1.15 (-2.48,0.18)	
0.87 (-1.20,2.94)	-0.27 (-2.93,2.39)	**Steroid Inj**		-0.88 (-3.18,1.43)	0.05 (-1.27,1.37)
0.27 (-1.32,1.86)	-0.87 (-4.59,2.85)	-0.60 (-3.22,2.01)	**Orthoses**		
-0.01 (-3.09,3.08)	-1.15 (-2.48,0.18)	-0.88 (-3.18,1.42)	-0.28 (-3.75,3.20)	**Exe**	
0.92 (-0.68,2.53)	-0.22 (-3.18,2.74)	0.05 (-1.27,1.36)	0.65 (-1.61,2.91)	0.93 (-1.72,3.58)	**ESWT**

C

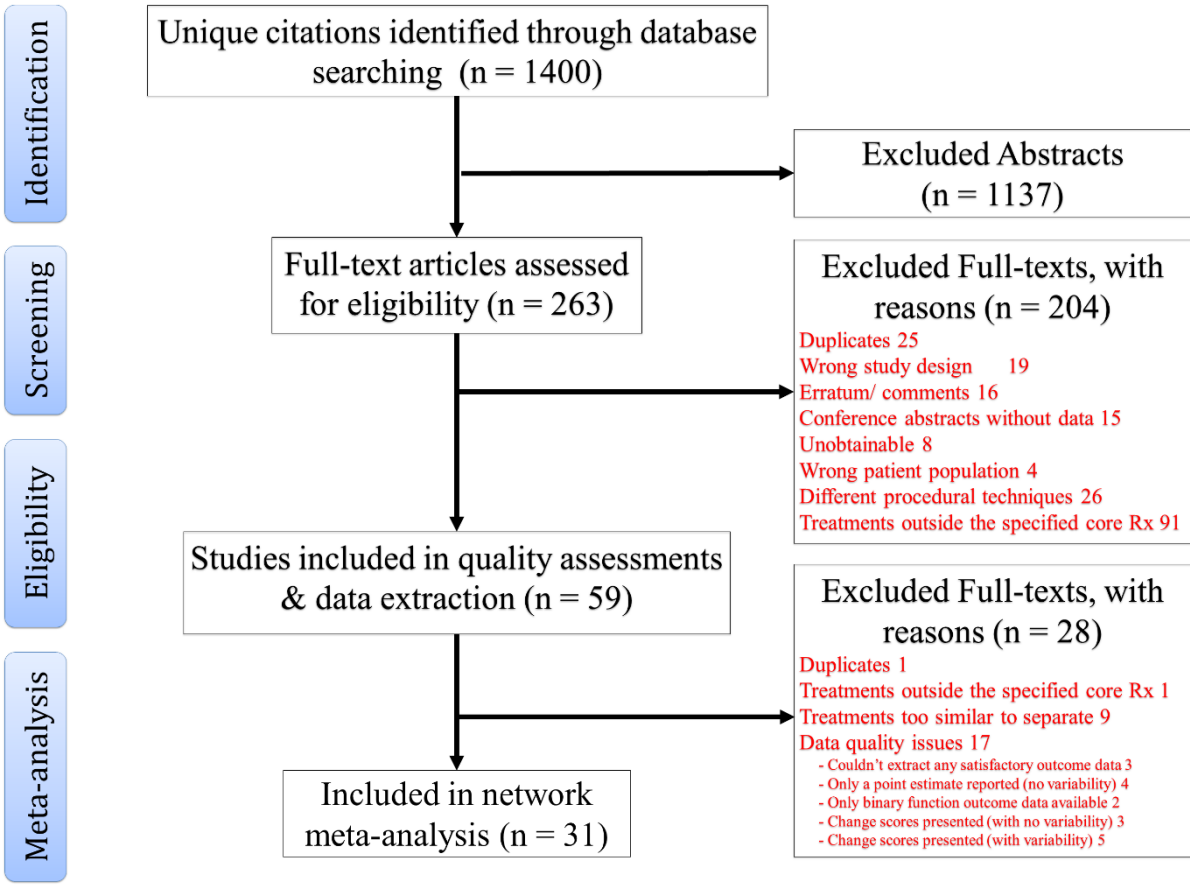
Placebo		0.11 (-0.26,0.47)		**0.95 (0.50,1.40)**
0.93 (0.23,1.63)	**Steroid Inj**		0.16 (-0.47,0.79)	0.02 (-0.51,0.56)
0.11 (-0.26,0.47)	**-0.82 (-1.61,-0.03)**	**Orthoses**		
1.09 (0.15,2.03)	0.16 (-0.47,0.79)	0.98 (-0.03,1.99)	**Exe**	
0.95 (0.50,1.40)	0.03 (-0.51,0.56)	**0.84 (0.26,1.43)**	-0.14 (-0.96,0.69)	**ESWT**

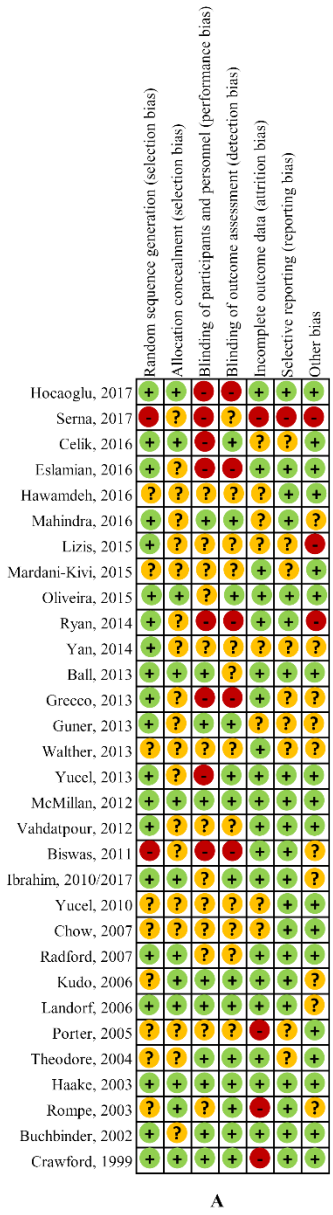
Treatment abbreviations: ESWT=Extracorporeal shockwave therapy, Exe=exercise, Orthoses=prefabricated or customised foot orthoses, Placebo=usual care/placebo, Steroid Inj=corticosteroid injection, and Steroid Inj+Exe=corticosteroid injection combined with exercise.

Table 4. Network meta-analysis treatment ranking results for function outcome analyses, for each of: short term outcomes, medium term outcomes, and long term outcomes. Surface under cumulative ranking curve (SUCRA) values (0-100) and mean ranks are presented, based on a simulation with 1000 replications. Note: higher SUCRAs and lower mean ranks indicate better performing treatments.

	Short Term Function		Medium Term Function		Long Term Function	
Treatment	**SUCRA**	**Mean Rank**	**SUCRA**	**Mean Rank**	**SUCRA**	**Mean Rank**
ESWT	69.5	2.5	65.6	2.7	72.8	2.1
Exe	32.2	4.4	29.9	4.5	82.1	1.7
Orthoses	31.8	4.4	42.4	3.9	19.4	4.2
Placebo	16.9	5.2	28.1	4.6	7.3	4.7
Steroid Inj	78.9	2.1	62.7	2.9	68.4	2.3
Steroid Inj +Exe	70.6	2.5	71.4	2.4		

Treatment abbreviations: ESWT=Extracorporeal shockwave therapy, Exe=exercise, Orthoses=prefabricated or customised foot orthoses, Placebo=usual care/placebo, Steroid Inj=corticosteroid injection, and Steroid Inj+Exe=corticosteroid injection combined with exercise.

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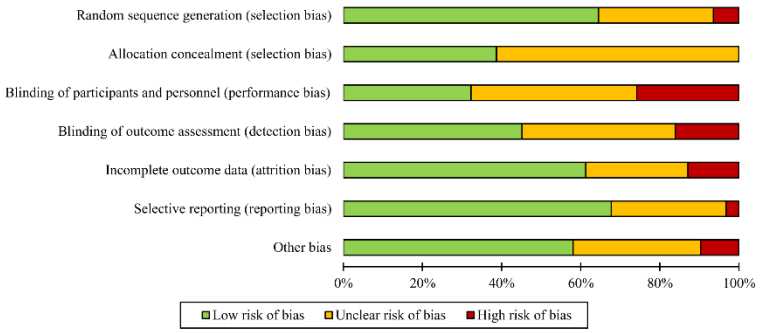
Blinding of outcome assessment (detection bias)
Incomplete outcome data (attrition bias)
Selective reporting (reporting bias)
Other bias
Hocaoglu, 2017
Serna, 2017
Celik, 2016
Eslamian, 2016
Hawamdeh, 2016
Mahindra, 2016
Lizis, 2015
Mardani-Kivi, 2015
Oliveira, 2015
Ryan, 2014
Yan, 2014
Ball, 2013
Grecco, 2013
Guner, 2013
Walther, 2013
Yucel, 2013
McMillan, 2012
Vahdatpour, 2012
Biswas, 2011
Ibrahim, 2010/2017
Yucel, 2010
Chow, 2007
Radford, 2007
Kudo, 2006
Landorf, 2006
Porter, 2005
Theodore, 2004
Haake, 2003
Rompe, 2003
Buchbinder, 2002
Crawford, 1999

A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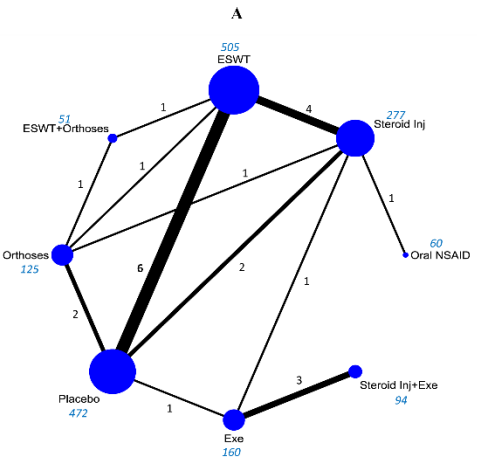
Allocation concealment (selection bias)
Blinding of participants and personnel (performance bias)
Blinding of outcome assessment (detection bias)
Incomplete outcome data (attrition bias)
Selective reporting (reporting bias)
Other bias
0%
20%
40%
60%
80%
100%
Low risk of bias
Unclear risk of bias
High risk of bias

B


A
505
ESWT
277
Steroid Inj
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ESWT+Orthoses
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Oral NSAID
Orthoses
125
Placebo
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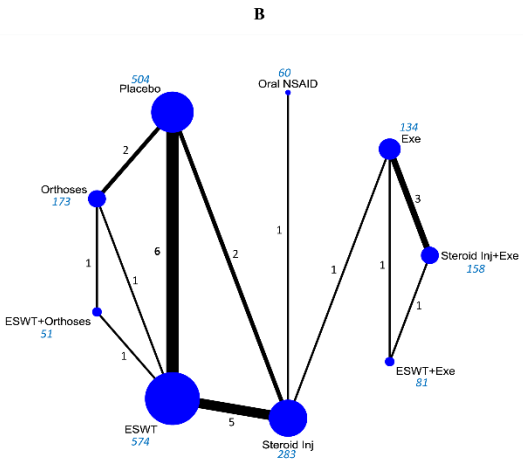
Exe
160
Steroid Inj+Exe
94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Placebo
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Oral NSAID
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Exe
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Steroid Inj+Exe
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Steroid Inj
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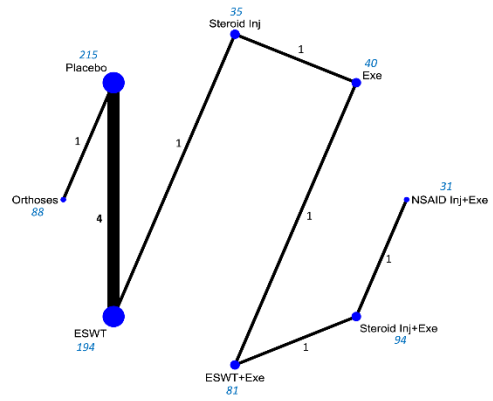
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Steroid Inj
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NSAID Inj+Exe
Orthoses
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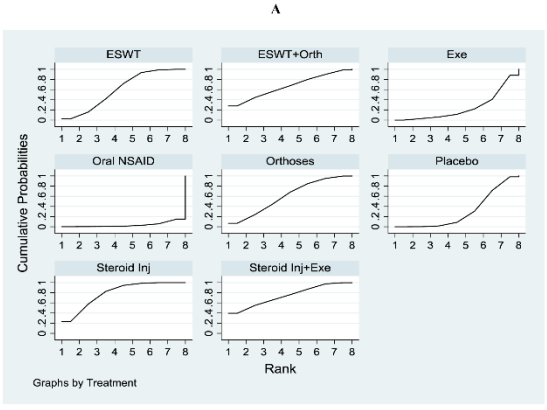
ESWT+Exe
81


A
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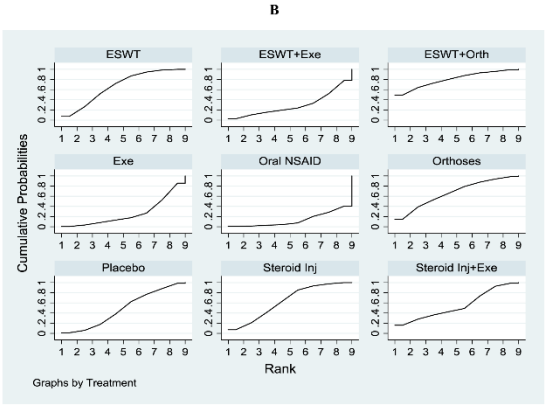
ESWT+Orth
Exe
Oral NSAID
Orthoses
Placebo
Steroid Inj
Steroid Inj+Exe
Cumulative Probabilities
Rank
Graphs by Treatment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Placebo
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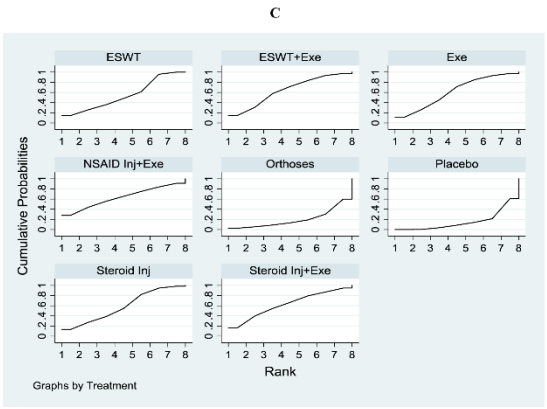
Steroid Inj+Exe
Cumulative Probabilities
Rank
Graphs by Treatment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ESWT
ESWT+Exe
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NSAID Inj+Exe
Orthoses
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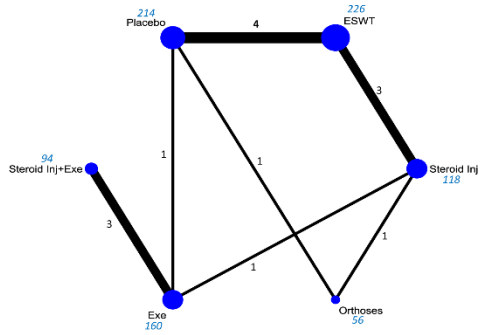
Steroid Inj
Steroid Inj+Exe
Cumulative Probabilities
Rank
Graphs by Treatment

A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Steroid Inj+Exe
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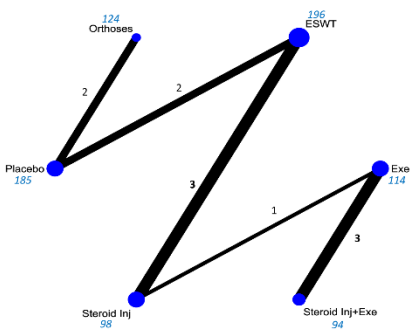
Orthoses
56

B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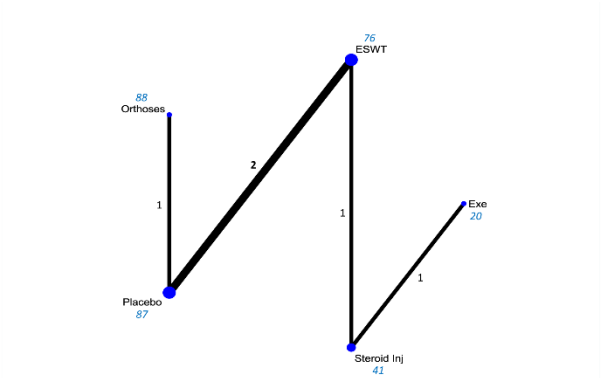
C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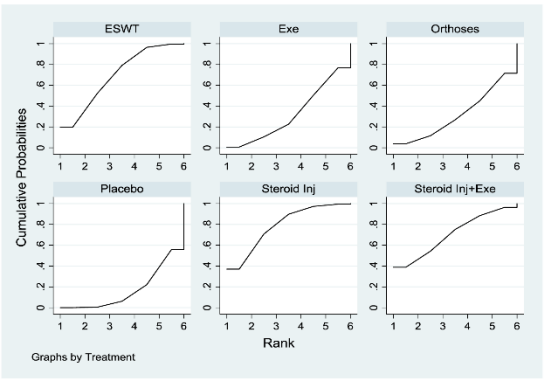
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Exe
Orthoses
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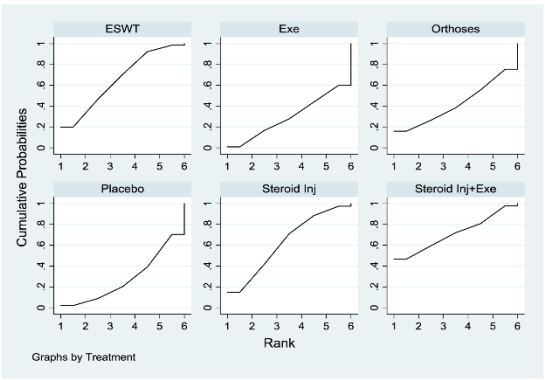
Steroid Inj+Exe
Cumulative Probabilities
Rank
Graphs by Treatment

B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Cumulative Probabilities
Rank
Graphs by Treatment

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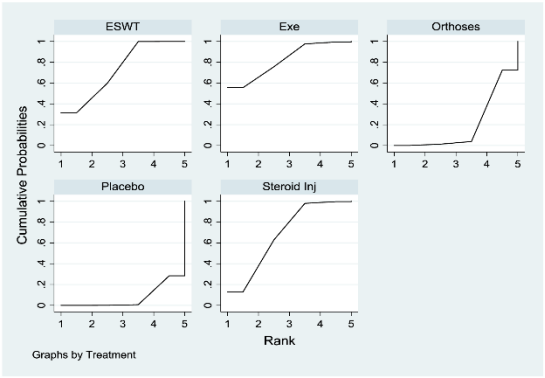
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Exe
Orthoses
Placebo
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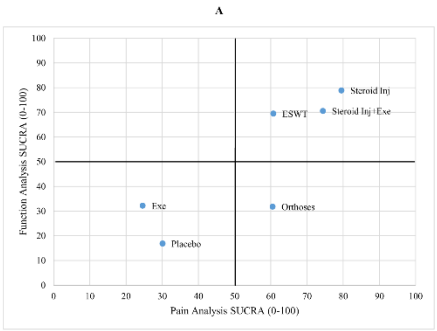
Cumulative Probabilities
Rank
Graphs by Treatment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Pain Analysis SUCRA (0-100)
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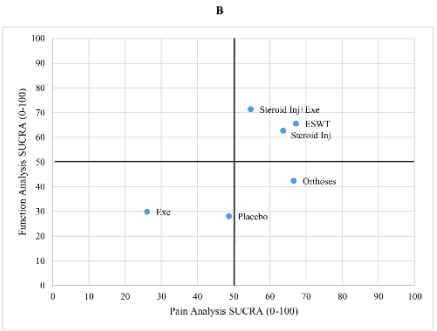
ESWT
Steroid Inj+Exe
Exe
Orthoses
Placebo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Pain Analysis SUCRA (0-100)
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ESWT
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Orthoses
Exe
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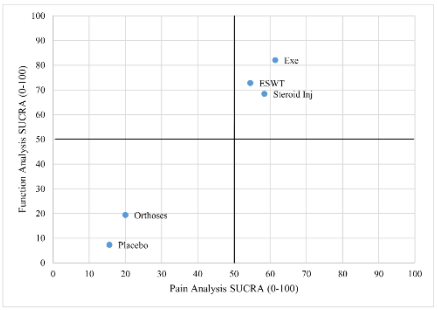
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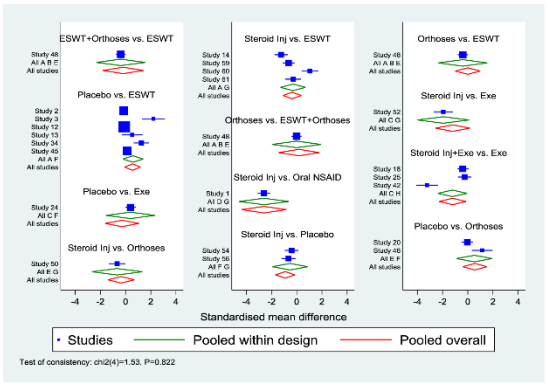
Pain Analysis SUCRA (0-100)
Exe
ESWT
Steroid Inj
Orthoses
Placebo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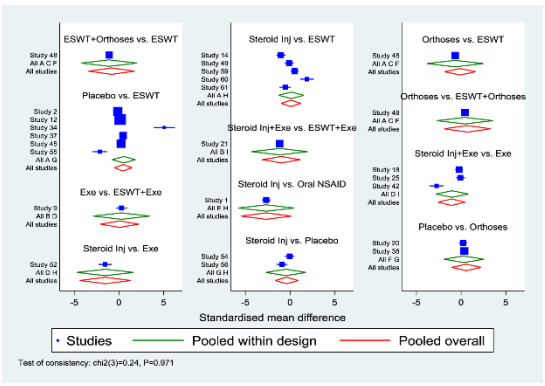
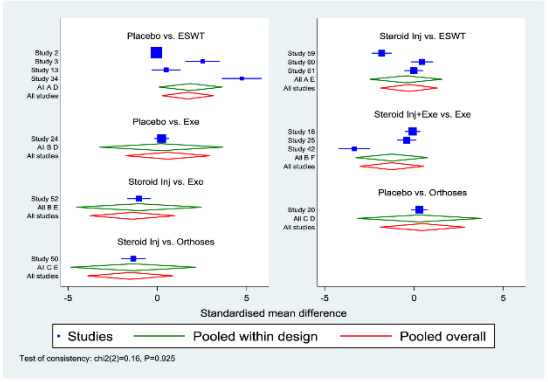
ESWT+Orthoses vs. ESWT
Placebo vs. ESWT
Placebo vs. Exe
Steroid Inj vs. Orthoses
Steroid Inj vs. ESWT
Orthoses vs. ESWT+Orthoses
Steroid Inj vs. Oral NSAID
Steroid Inj vs. Placebo
Orthoses vs. ESWT
Steroid Inj vs. Exe
Steroid Inj+Exe vs. Exe
Placebo vs. Orthoses
Standardised mean difference
Studies
Pooled within design
Pooled overall
Test of consistency: chi2(4)=1.53, P=0.822


B
ESWT+Orthoses vs. ESWT
Placebo vs. ESWT
Exo vs. ESWT+Exo
Steroid Inj vs. Exe
Steroid Inj vs. ESWT
Steroid Inj+Exe vs. ESWT+Exe
Steroid Inj vs. Oral NSAID
Steroid Inj vs. Placebo
Orthoses vs. ESWT
Orthoses vs. ESWT+Orthoses
Steroid Inj+Exe vs. Exe
Placebo vs. Orthoses
Standardised mean difference
Studies
Pooled within design
Pooled overall
Test of consistency: chi2(3)=0.24, P=0.971


C
Placebo vs. ESWT
Placebo vs. Exe
Steroid Inj vs. Exe
Steroid Inj vs. Orthoses
Steroid Inj vs. ESWT
Steroid Inj+Exe vs. Exe
Placebo vs. Orthoses
Standardised mean difference
Studies
Pooled within design
Pooled overall
Test of consistency: chi2(2)=0.16, P=0.925

PHP NMA Appendix I

Search Strategy (run on 31.01.18). RCT Filter: Cochrane Handbook sensitivity and precision maximising

EMBASE

1. (plantar adj3 fasci$).mp.
2. (heel adj3 pain$).mp.
3. calcaneodynia.mp.
4. (plantar adj3 aponeurosis).mp.
5. (heel adj3 spur$).mp.
6. (calcane$ adj3 spur$).mp.
7. or/1-6
8. random$.ti,ab.
9. factorial$.ti,ab.
10. crossover$.ti,ab.
11. cross over$.ti,ab.
12. placebo$.ti,ab.
13. (doub$ adj blind$).ti,ab.
14. (sing$ adj blind$).ti,ab.
15. assign$.ti,ab.
16. allocat$.ti,ab.
17. volunteer$.ti,ab.
18. double-blind procedure/
20. crossover-procedure/
21. randomized controlled trial/
22. single-blind procedure/
23. or/8-21
24. 7 and 22
25. exp animal/ not human/
26. 23 not 24
27. limit 25 to embase

CINAHL (HDAS) RCT Filter: based on Pubmed Cochrane filter

"((((plantar ADJ3 (fasci*).af) OR (heel ADJ3 (pain*).af) OR (calcaneodynia).af OR (plantar ADJ3 (aponeurosis).af) OR (heel ADJ3 (spur*).af) OR (calcane* ADJ3 (spur*).af)) AND (("randomized controlled trial").pt OR ("controlled clinical trial").af OR (randomized).ti,ab OR (placebo).ti,ab OR exp CLINICAL TRIALS/ OR (randomly).ti,ab OR (trial).ti)) NOT (exp ANIMALS/ NOT HUMANS/))

PubMed

((((((randomized controlled trial[Publication Type]) OR (controlled clinical trial[Publication Type]) OR (randomized[Title/Abstract]) OR (placebo[Title/Abstract]) OR ("Clinical Trials as Topic"[Mesh:noexp]) OR (randomly[Title/Abstract]) OR (trial[Title])))) AND (((plantar AND fasci*) OR (heel AND pain*) OR (calcaneodynia) OR (plantar AND aponeurosis) OR (heel AND spur*) OR (calcane* AND spur*)))))) NOT ((animals[mh] NOT humans[mh]))

Cochrane Library

#1 plantar near/3 fasci*
#2 heel near/3 pain*
#3 calcaneodynia
#4 plantar near/3 aponeurosis #5 heel near/3 spur*
#6 calcane* near/3 spur*
#7 #1 or #2 or #3 or #4 or #5 or #6

AMED (HDAS) RCT Filter: based on Pubmed filter

"((((plantar ADJ3 (fasci*).af) OR (heel ADJ3 (pain*).af) OR (calcaneodynia).af OR (plantar ADJ3 (aponeurosis).af) OR (heel ADJ3 (spur*).af) OR (calcane* ADJ3 (spur*).af)) AND (("randomized controlled trial").pt OR ("controlled clinical trial").pt OR (randomized).ti,ab OR (placebo).ti,ab OR exp CLINICAL TRIALS/ OR (randomly).ti,ab OR (trial).ti)) NOT (exp ANIMALS/ NOT HUMANS/))

Pedro

Title & Abstract: Plantar fasci* (selected combine terms with AND)
Title & Abstract: heel pain* (selected combine terms with AND)
Title & Abstract: calcaneodynia (selected combine terms with AND)
Title & Abstract: plantar aponeurosis (selected combine terms with AND)
Title & Abstract: heel spur* (selected combine terms with AND)
Title & Abstract: calcane* spur* (selected combine terms with AND)

Clinicaltrials.gov

Nb: words in brackets are automatically searched as AND
(plantar fasciitis) OR (plantar fasciopathy) OR (plantar fasciosis) OR (heel pain) OR (painful heel) OR calcaneodynia OR (plantar aponeurosis) OR (heel spur) OR (heel spurs) OR (calcaneal spur) OR (calcaneal spurs)

Web of Science (Indexes=SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH)
RCT Filter: based on Pubmed filter

# 14	#13 AND #7
# 13	#12 OR #11 OR #10 OR #9 OR #8
# 12	ti=trial
# 11	ts=placebo
# 10	ts=(randomly OR randomized)
# 9	ts="clinical trial*"
# 8	ts="randomized controlled trial"
# 7	#6 OR #5 OR #4 OR #3 OR #2 OR #1
# 6	ts=(calcane* near/3 spur*)
# 5	ts=(heel near/3 spur*)
# 4	ts=(plantar near/3 aponeurosis)
# 3	ts=calcaneodynia
# 2	ts=(heel near/3 pain*)
# 1	ts=(plantar near/3 fasci*)

Notes for using Cochrane Risk of Bias tool

Random sequence generation

High risk if clearly non-random method used, e.g, alternating allocation, or based on a date

Unclear if not enough information given to judge

Low risk if randomisation method described is appropriate, e.g. computer-generated sequence, or use of random number tables to generate sequence

Allocation concealment

High risk if personnel responsible for the selection of trial participants can influence allocation of next patient

Unclear if not described

Low risk if appropriate method used such as remote randomisation or sealed, opaque envelopes

Blinding of participants and personnel

High risk if neither are blinded

Unclear if not reported or if only participants OR personnel (e.g. clinicians proving treatment) but not both blinded

Low risk if both are blinded

Blinding of outcome assessors

High risk if outcome assessors (or participants if self-reported measure, eg pain) not blinded

Unclear if not reported

Low risk if outcome assessors (or participants if self-reported measure, eg pain) are blinded

Incomplete outcome data

High risk if >20% dropout rate OR attrition is clearly uneven between groups

Unclear if not reported

Low risk if dropouts <20% and attrition similar in groups

Selective outcome reporting

High risk if results for outcomes mentioned in methods not reported

Unclear if results not reported for all outcomes or unsure

Low risk if results for all outcomes mentioned are reported

Other sources of bias

High risk if any other concerns about validity/conduct of the trial, e.g. baseline imbalance, conflicts of interest, issues with treatment adherence, in appropriate ways of dealing with missing values, or other methodological issues

Table 1. Characteristics of findings table for analysed studies; n=31

First Author / Yr	Country	Study setting	Diagnosis/ Inclusion criteria	Sample size at randomisation	mean age Intervention/control arm ± SD	Mean Duration of symptoms (weeks)	Intervention description and dose / No of sessions/ Duration of treatment :	Control/Intervention II description and dose / No of sessions/ Treatment duration:	Delivered by?	Comments Co-interventions
Biswas 2011	India	Tertiary care	Plantar fasciitis <3 months, no prior treatment, VAS score 5-9 in 10cm scale.	120	41.7 ± 8.87 38.4 ± 11.63	<12	Steroid Injection: single injection 40 mg (1 ml) methylprednisolone and 2 ml of 0.5% bupivacaine. **Co-interventions:** ice, avoid strenuous activity >48 hours, stretching exercises after 1 week.	NSAIDs: oral diclofenae (50 mg) and paracetamol (500 mg), twice daily plus ranitidine (150 mg) for 4 weeks **Co-interventions:** NR	NR	All: use soft heel foot wear, not stand for long time, and not walk bare foot.
Buchbinder 2002	Australia	Outpatient	Plantar fasciitis > 6 weeks, ultrasound confirmed lesion	166	52.2 ± 12.81 54.2 ± 12.05	ESWT/control group: median 36/43	ESWT: 3 sessions of 2000/2500 shock waves per treatment for 3 weeks. Total dose 1000 mJ/mm2. Ultrasound gel used.	Placebo ESWT: 3 sessions of 100 shock waves per treatment, for 3 weeks. Total dose 6.0 mJ/mm2.	Qualified health professional	All: allowed to continue to wear orthotics/splints as prescribed, new orthopaedic devices not allowed; only paracetamol, no other therapies allowed.
Chow 2007	Hong Kong	Outpatient	Chronic heel pain>3 months.	57	51.94 ± 11.68 50.64 ± 9.75	40	ESWT: 3 sessions (1 per wk) of 1000 shock wave impulses, 3 Hz. Dose 0.05 mJ/ mm2, increasing to highest possible tolerable pain level. Ultrasound used.	Placebo ESWT: 3 sessions (1 per wk) of 30 shock wave impulses, 3 Hz. Dose 0.03 mJ/ mm2. Ultrasound used.	NR	Maximum tolerable' energy density group, starting density 0.05 mJ/mm2, increased by a 'staircase' method after every 200 impulse application.
Grecco 2013	Brazil	Hospital/Rehabilitation	Plantat fasciitis > 3 months; fascia thickness	40	NR	Unclear	ESWT + Exercise: 3 sessions (1 per wk) of 2 000 shock waves at 6Hz and pressure of 3 bar. Stretching exercises as home programme	Exercise: 10 sessions (5 weeks) of Physiotherapy incorporating Ultrasound (1Hz, intensity 1.2 W/cm2 for 5 minutes) and stretching	ESWT by Physician; Placebo by Physiotherapist	
Haake 2013	Germany	Hospital/Rehabilitation	Plantar fasciitis with proven heel spur, failed >6 month conservative treatment, 4 weeks Therapy free period before referral	272	53.1 ± 10.8 52.9 ± 10.8	56	ESWT: 3 sessions (over 6 weeks) ESWT 4 000 waves under local anaesthesia. Dose: 0.08mj/mm2	Placebo: 3 sessions (over 6 weeks) of sham ESWT under local anaesthesia	Physician	

Hawamdeh 2016	Jordan	Hospital/Rehabilitation	Plantar fasciitis; able to walk > 50metres without support.	34	Unclear	NR	ESWT: 3 sessions (over 3 wks) of 2000 shockwaves Dose: 0.25mj/mm2	Placebo: 3 sessions (3 wks.) - sham ESWT	Physiotherapist	All: Ice + stretches for the plantar fascia
Mardani-Kivi 2015	Iran	Outpatient	Acute plantar fasciitis <6 weeks, VAS>5	84	43.91 ± 7.96 44.68 ± 9.2	NR	ESWT: 3 sessions (over 3 wks), intermediate shock wave therapy (electrohydraulic system) of 2000 wave impulses at an energy level of 0.15 mJ/mm2. Dose: 900 mJ/mm2	Steroid Injections: 1 mL of methyl prednisolone acetate (40 mg) and 1 mL of lidocaine 2%	NR	All: No running/long walk, night-splints, massage, NSAIDs, narcotics
McMillan 2012	Australia	Community	Plantar fasciitis > 8 weeks duration, >20/100 on VAS, plantar fascia thickening on ultrasound (>4.0mm)	82	51.7 ± 11.9 53.6 ± 9	42	Steroid Injections + exercise: intrafascial injection of 1 mL of 4 mg/mL dexamethasone sodium phosphate (following prior ultrasound-guided posterior tibial nerve block with 2% lidocaine hydrochloride) Daily stretching programme for first 8 weeks.	Exercise: daily stretching programme for 8 weeks ultrasound-guided injection with 1 mL 0.9% sodium chloride and tibial nerve block with 2% lidocaine hydrochloride.	Podiatrist	No further detail reported about the stretching programme.
Oliveira 2015	Brazil	Outpatient	Plantar fasciitis foot pain 3-8 cm on a 0-10 NRS, age ≥ 18yrs	74	48 ± 10.1 53 ± 10.8	48	Custom orthoses: ethylene vinyl acetate Total contact insole, for "day-to-day use" for 26 wks	Placebo: flat insole for 26 wks	NR	All: Diclofenac permitted
Porter 2005	Australia ?	Unclear	Proximal plantar fasciopathy Plantar heel pain, worse in morning, duration at least 6 weeks	132	39.9 ± NR 38.6 ± NR	11.8	Steroid Injections + ESWT: 1 ml betamethasone (5.7mg) and 2ml 1% lignocaine. 3 applications of 1000 pulses of energy density 0.08/mm^2	ESWT + exercise: 3 applications (3wks) of 1000 pulses of energy density 0.08/mm^2 Stretching exercise as home programme.	Steroid injection by Physician ESWT: NR	
Radford 2007	Australia	Community	Plantar heel pain >4 weeks	92	50.7 ± 11.8 50.1 ± 11	56	Exercise: Stretching while standing on standardised, supplied wedge + sham ultrasound session 5 min/day over 2 weeks	Placebo: sham ultrasound-**3mins.**	NR	All: Advice not to commence any new treatments
Ryan 2013	Canada	Community	Chronic plantar fasciopathy >12 months, >20 on 100mm VAS for pain.	56	52.4 ± 7.5 46.2 ± 8.5	287	Exercise: 12 week exercise programme: karaoke, balance/ stretching	Steroid Injections + Exercise: palpation guided, cortiosteroid injection (1ml dexamethasone plus 0.5ml 1% lidocaine)	Exercise instruction by physiotherapist Injection by	

								Co-interventions: In group 2 (injection): additional daily calf stretching exercises	trained physician	
Ibrahim 2010	US	Primary care	Painful heel (unilateral and chronic). 6 months failed conservative treatment, > 4 weeks therapy free period before referral.	50	56.6 ± 2.71 49.1 ± 2.55	NR	ESWT: 2 sessions 2,000 impulses (Air pressure of device at 3.5 bar) Dose =0.16 mJ/mm^2; 15 mm applicator at frequency of 8 Hz.	Placebo: 2 sessions of sham ESWT performed with clasp on heel to prevent transmission of impulses from applicator to skin	Principal Investigator	Standardised protocol but PI not blinded.
Kudo 2006	Canada	Outpatient	Plantar fasciitis > 6 months, stretching program within last 6mths, VAS>5; >6mths unsuccessful conservative therapy (can include NSAIDs), RandM scores of >=3	114	51.1 ± 10.6 48.8 ± 9.8	126.4	ESWT: 1 session of 3800 shockwaves, total energy delivery of 1,300 mJ/mm^2 (ED+) or 2,330 mJ/mm^2 (ED).	Placebo: sham ESWT with thin foam cushion and ultrasound gel.	Primary care, sport medicine physicians or orthopaedic specialists.	Both groups received 5 mL of 1% Xylocaine (medial calcaneal nerve block), 15–20 min prior to the procedure.
Landorf 2006	Australia	Community	Plantar fasciitis PF symptoms for > 4 weeks	136	47.3 ± 11.6 48.5 ± 9.6	52	Prefabricated orthoses: strong foot support mould made from firm density polyethylene foam.	Custom orthosis: Strong foot support for individual patient	Principal investigator	3rd arm-Placebo: sham orthosis-minimal foot support from soft (120 kg/m^3) ethyl vinyl acetate foam over an unmodified cast of the foot.
Mahindra 2016	India	Unclear	Chronic heel pain; failed >3 months of conservative trt	75	33.92 ± 8.61 35.48 ± 9.54	NR	Steroid Injections + Exercise: 1 Dose 2mL of 40mg of methylprednisolone. Physical therapy to stretch calf and PF	Exercise: Physical therapy to stretch calf and PF injection of normal saline	NR	Used two out of three interventions in analysis
Theodore 2004	USA/Germany?	Unclear	Chronic plantar fasciitis (unilateral); > 6 mnth; stretching programme in last 6 mnth; VAS first step pain >5; Roles and Maudsley 3 or 4; unsuccessful conservative therapy	150	50 ± NR 53 ± NR	91.5	ESWT: 3800 shocks (3500 at 0.36 mJ/mm2) for a total of 1300 mJ/mm2 (generated using the Epos Ultradevice. Medial calcaneal nerve block using 5 mL of 1% xylocaine 15–20 minutes prior to the procedure).	Placebo: sham ESWT. With thin air cushion on the therapy head	NR	

Walther 2013	Germany	Unclear	Plantar fasciitis (clinical diagnosis with MRI)	30	51.6 ± 12.5 53.8 ± 13.2	~10	Custom orthoses: Rigid material with a layered, polyurethane cushion zone. Individualization for each Patient was carried out with the help of an orthopaedic technician.	Placebo: Thin, non-supportive orthotic, made of polyethylene (PE) and thin polyurethane (PU). Besides trimming for sizing purposes, no further adjustments are possible.	Orthopaedic technician	Used two out of three interventions in analysis No co-interventions allowed (all groups)
Yan 2014	China	Unclear	Plantar fasciitis (clinical diagnosis with ultrasound or MRI)	153	NR	94.24+/-39.92	ESWT + custom orthoses: 5 sessions (1 per wk) 1000-2000 Shockwave 10-15Hz; pressure-1-4 bar Custom orthoses	ESWT: 5 sessions (once a week) 1000-2000 Shockwave 10-15Hz; pressure-1-4 bar.	NR	3rd arm : custom orthoses
Yucel 2010	unclear	Unclear	Plantar fasciitis > 6mnths; unsuccessful conservative therapy.	60	44.7 ± 9.2 42.9 ± 7.08	38.6	Steroid Injections: 0.5 mL combined betamethasone dipropionate (6.43 mg/mL) and betamethasone sodium phosphate (2.63 mg/mL) and 0.5 mL of prilocaine hydrochloride, 2% (20 mg/mL) applied to the most painful area over the medial calcaneal tuberosity determined by palpation. Patients were instructed to refrain from running and impact activities for 10 days.	ESWT: Single application of 3000 shock-waves using an electrohydraulic shockwave generator. Fivefold nerve block was applied with 20 mL of prilocaine hydrochloride, 2%. ultrasound gel was used as a contact medium.	NR	Except for the continued use of heel cups, no additional treatment was permitted.
Yucel 2013	Turkey	Outpatient	Plantar fasciitis (unilateral) pain> 3 months; First-step pain >4 (0–10 VAS).	44	45.6 ± 9.3 47.4 ± 7.9	29.2	Steroid Injections: Single Ultrasound guided injection of 1 mL betamethasone dipropionate (6.43mg/ml) and betamethasone sodium phosphate (2.63 mg/mL) combination plus 1 mL lidocaine HCl 20 mg/2 mL).	prefabricated orthoses: full-length silicone insole worn in daily lives for 4 weeks. No change to usual diet, daily activities, and sporting habits.	NR	Simple analgesics (such as acetaminophen) was allowed if necessary, except last 24 h before evaluations
Celik 2016	Turkey	Hospital/Rehabilitation	Plantar fasciitis; a negative tarsal tunnel test, and a positive windlass test.	43	45.6 ± 7.9 45.4 ± 9.3	~48	Steroid Injections: 1 mL of corticosteroid (40 mg methylprednisolone acetate) or 4 mL of 2% prilocaine hydrochloride was injected using a 22-gauge needle.	Exercise: 9 sessions (3 weeks) of Joint mobilisation, gastrocnemius stretching, plantar fascia-specific stretching. (Stretching for a count of 30 and to repeat it a total of 10 times)	Injection by Physician Exercise by Physiotherapist	Exercise group patients were advised to repeat the same stretching exercises on their own. No calf stretches performed for injection group.

Crawford 1999	UK	Hospital/Rehabilitation	Heel pain	106	59.41 ± 11.84 56.88 ± 13.02	~24	Steroid Injections: 1 ml of 25 mg/ml of prednisolone acetate with 1 ml of 2% lignocaine to medial aspect of the heel pad once	Placebo: 2 ml of 1% lignocaine hydrochloride once.	Physician	Used two out of four interventions in analysis**.** Patients using orthoses, insoles, pads or analgesia allowed to continue as normal.
Vahdatpour 2012	Iran	Outpatient	Plantar fasciitis> three months, failed previous treatments	40	50.6 ± 10 48.1 ± 8.9	NR	ESWT: 3 applications (over 3 wks) of 2000 focused shock waves and 2000 radial pulses (4000 shock waves/session of 0.2 mJ/mm2).	Placebo: sham ESWT, minimal energy pulses (0.04 mJ/ mm2).	NR	Conservative managements including stretching exercise, using NSAIDs, and heel pad were permitted in both groups
Ball 2013	Northern Ireland	Secondary care	Plantar fasciitis, failed conservative treatment > 8 weeks	65	49 ± 12.9 50.1 ± 10.7	24 Median	Steroid Injections: 2 Ultrasound guided injection, 0.5 ml (20 mg) of methylprednisolone acetate +0.5 ml of 0.9% saline over 6 or 12 wks.	Placebo: ultrasound guided injection, 1 ml of 0.9% saline. 2nd application at 6 or 12 weeks.	Grp 1 Experienced Physician. Grp 2 Physician (naïve to ultrasound guided technique)	3 arm trial. (3rd arm unguided injection dropped from the analysis). All patients were asked to avoid weight bearing on the heel pad for 48h and allowed to continue usual analgesics
Lizis 2015	Poland	Hospital/ Rehabilitation	Plantar fasciitis (not explicitly stated in text)	30	NR	NR	ESWT: 1000 or 2000 shock waves per treatment, energy levels varying between 0.02 and 0.33 mJ/mm^2, pulse freq gradually increased to 240/min over 5 wks.	Placebo: Sham ESWT of 100 shock waves per treatment, energy level of 0.02 mJ/mm^2, frequency 60/min	NR	Only long term outcome data (12 months) reported and analysed in the long term networks.
Guner 2013	Turkey?	Unclear	Plantar fasciitis. failed conservative treatments > 3 mths	64	41.4±12.	NR	NSAIDs: 1 application of Local injection of 1 mL of tenoxicam (20 mg/2 mL) and 1 mL of 2% lidocaine	Steroid Injections: Local injection of 1 mL of 40mg of methylprednisolone acetate and 1mL of 2% lidocaine.	Physician	Only long term outcome data (6, 12 months) reported. All arms: limit use of feet for ~ 4 weeks. 48 hours post injection. stretching & strengthening protocol given.
Rompe 2003	Germany	Outpatient	chronic plantar fasciitis Moderate-severe pain; >12 months, >/ 3 unsuccessful conservative	45	43±NR 40±NR	78-86	ESWT: 3 applications of 2 100 impulses of 0.16mJ/mm2, 4Hz radius 1.5-2cm over 3 wks.	Placebo: 3 applications of Sham ESWT over 3 wks with sound reflecting pad, no coupling gel.	physician	Only long term outcome data (6, 12 months) reported.

			treatments in previous 6 months							
Hocaoglu 2017	Turkey	Outpatient	Plantar fasciitis. non-response to conservative treatment for 6 months	72	50±8.3	34	ESWT: 3 applications of 2000 shockwaves at 10Hz frequency with an energy flux density per shock of 0.16mJ/mm2 over a week period	Steroid Injections: Single dose. 1ml of betamethasone sodium plus 0.5mL of prilocaine	Physiothera pist	Advice to avoid any pain provoking physical activity after treatment
Eslamian 2016	Iran	Hospital/ Rehabilita tion	Plantar fasciitis. failure to respond to conservative care for 2 months	40	41.4±8	9.5	ESWT: 5 applications of 2000 shockwaves at 2 pulses per second with an energy flux density per shock of 0.2mJ/mm2 over 2 weeks	Steroid Injections: Single dose of 40mg of methylprednisolone plus 1mL of 1% lidocaine	Unclear	Ice pack was given as co-intervention
Serna 2017	Columbi a	Hospital/ Rehabilita tion	Plantar fasciitis. Chronic (>3months), No response to previous (NSAIDs), intramuscular steroids and / or rehabilitation.	60	53 (range 26-72)	NR	ESWT: 2500 shocks in total per application. frequency range of 6-12 hertz (h). 4 sessions were performed in 8 to 10 days interval.	Steroid Injections: single dose of 3 cc lidocaine injections with epinephrine plus 2 cc of methylprednisolone acetate 40 mg / 1cc (Depomedrol R)	NR	Cold pack was given as co-intervention

NR: Not reported

Table 2. Between study variation, τ^2, from each type of network meta-analysis. Presented as mean (95% confidence interval).

Evidence base	τ^2; Mean (95% CI)
Short term pain	0.77 (0.27,1.52)
Medium term pain	2.02 (0.76,3.9)
Long term pain	0.64 (0.01,2.23)
Short term function	2.41 (0.61,5.4)
Medium term function	1.28 (0.18,3.37)
Long term function	0*

CI=confidence interval.

*Note: 95% CI not presented as no heterogeneity present

Table 3. Summary of all outcome data used, for each of the 31 studies included in network meta-analyses.

First Author, Publication Year	Treatment	Follow up	n_pain	n_function	Outcome, Mean (SD)		Outcome Measure	
					Pain	Function	Pain	Function
Hocaoglu, 2017	ESWT	1 month	36	36	50.00 (16.55)	124.90 (29.30)	VAS, 4. Overall/others	Total FFI
	Steroid Inj	1 month	36	36	40.00 (14.19)	78.60 (20.70)	VAS, 4. Overall/others	Total FFI
	ESWT	3 months	36	36	35.00 (11.82)	67.00 (29.70)	VAS, 4. Overall/others	Total FFI
	Steroid Inj	3 months	36	36	42.50 (16.55)	57.00 (19.10)	VAS, 4. Overall/others	Total FFI
Serna, 2017	ESWT	1 month	27	36	2.70 (2.33)	-68.52 (41.32)	VAS, 4. Overall/others	AOFAS Ankle-Hindfoot Scale*
	Steroid Inj	1 month	16	22	2.12 (1.59)	-68.72 (44.08)	VAS, 4. Overall/others	AOFAS Ankle-Hindfoot Scale*
	ESWT	3 months	27	36	1.96 (1.91)	-71.22 (42.38)	VAS, 4. Overall/others	AOFAS Ankle-Hindfoot Scale*
	Steroid Inj	3 months	16	22	1.12 (0.34)	-71.27 (44.87)	VAS, 4. Overall/others	AOFAS Ankle-Hindfoot Scale*
	ESWT	12 months	25	35	1.68 (1.97)	-67.82 (44.37)	VAS, 4. Overall/others	AOFAS Ankle-Hindfoot Scale*
	Steroid Inj	12 months	16	22	1.31 (1.01)	-66.68 (46.22)	VAS, 4. Overall/others	AOFAS Ankle-Hindfoot Scale*
Celik, 2016	Steroid Inj	6 weeks	20	20	1.20 (1.40)	-85.70 (11.20)	VAS, 3. Activity	FAAM*
	Exe	6 weeks	21	21	5.00 (2.30)	-70.20 (17.50)	VAS, 3. Activity	FAAM*
	Steroid Inj	3 months	20	20	1.50 (1.90)	-83.50 (14.60)	VAS, 3. Activity	FAAM*
	Exe	3 months	21	21	4.90 (2.40)	-69.40 (16.80)	VAS, 3. Activity	FAAM*
	Steroid Inj	12 months	19	19	3.30 (3.20)	-83.40 (17.30)	VAS, 3. Activity	FAAM*
	Exe	12 months	20	20	2.70 (3.20)	-86.70 (21.90)	VAS, 3. Activity	FAAM*
Eslamian, 2016	ESWT	6 weeks	20	20	4.80 (0.56)	29.70 (20.83)	VAS, 2. Morning	Total FFI
	Steroid Inj	6 weeks	20	20	5.40 (0.56)	38.20 (16.27)	VAS, 2. Morning	Total FFI
	ESWT	10 weeks	20	20	3.40 (0.62)	19.60 (21.26)	VAS, 2. Morning	Total FFI
	Steroid Inj	10 weeks	20	20	4.60 (0.62)	31.50 (20.53)	VAS, 2. Morning	Total FFI
Hawamdeh, 2016	ESWT	3 weeks	12	12	2.56 (1.33)	1.56 (0.73)	VAS, 4. Overall/others	R&M
	Placebo	3 weeks	12	12	4.00 (3.46)	2.08 (1.24)	VAS, 4. Overall/others	R&M

Mahindra, 2016	Steroid Inj+Exe	3 weeks	25	25	2.84 (1.46)	-86.60 (6.77)	VAS, 4. Overall/others	AOFAS Ankle-Hindfoot Scale*
	Exe	3 weeks	25	25	7.12 (1.12)	-53.88 (11.81)	VAS, 4. Overall/others	AOFAS Ankle-Hindfoot Scale*
	Steroid Inj+Exe	3 months	25	25	3.64 (1.62)	-81.32 (6.39)	VAS, 4. Overall/others	AOFAS Ankle-Hindfoot Scale*
	Exe	3 months	25	25	7.44 (1.04)	-50.84 (10.76)	VAS, 4. Overall/others	AOFAS Ankle-Hindfoot Scale*
Lizis, 2015	ESWT	12 months	16		3.30 (0.80)		VAS, 3. Activity	
	Placebo	12 months	14		4.70 (0.80)		VAS, 3. Activity	
Mardani-Kivi, 2015	ESWT	6 weeks	34		6.40 (3.20)		VAS, 4. Overall/others	
	Steroid Inj	6 weeks	34		2.20 (3.50)		VAS, 4. Overall/others	
	ESWT	3 months	34		6.90 (3.10)		VAS, 4. Overall/others	
	Steroid Inj	3 months	34		3.40 (3.70)		VAS, 4. Overall/others	
Oliveira, 2015	Orthoses	6 weeks	36	36	4.40 (2.40)	31.90 (17.20)	VAS, 3. Activity	Total FFI
	Placebo	6 weeks	36	36	4.30 (3.00)	37.20 (17.70)	VAS, 3. Activity	Total FFI
	Orthoses	3 months	35	35	3.50 (2.70)	27.00 (17.30)	VAS, 3. Activity	Total FFI
	Placebo	3 months	35	35	4.20 (3.20)	34.70 (21.30)	VAS, 3. Activity	Total FFI
Ryan, 2014	Exe	6 weeks	28	28	47.70 (25.93)	-72.60 (16.40)	VAS, 4. Overall/others	FADI*
	Steroid Inj+Exe	6 weeks	28	28	41.10 (25.93)	-79.40 (16.40)	VAS, 4. Overall/others	FADI*
	Exe	3 months	28	28	31.20 (25.40)	-78.70 (21.17)	VAS, 4. Overall/others	FADI*
	Steroid Inj+Exe	3 months	28	28	29.20 (21.17)	-84.00 (21.17)	VAS, 4. Overall/others	FADI*
Yan, 2014	ESWT+Orth	1 month	51		3.14 (1.61)		VAS, 3. Activity	
	ESWT	1 month	53		3.78 (1.64)		VAS, 3. Activity	
	Orthoses	1 month	49		3.12 (1.71)		VAS, 3. Activity	
	ESWT+Orth	3 months	51		1.95 (1.43)		VAS, 3. Activity	
	ESWT	3 months	53		3.61 (1.62)		VAS, 3. Activity	
	Orthoses	3 months	49		2.60 (1.46)		VAS, 3. Activity	
Ball, 2013	Steroid Inj	6 weeks	44		31.70 (27.85)		VAS, 4. Overall/others	
	Placebo	6 weeks	19		50.90 (31.40)		VAS, 4. Overall/others	
	Steroid Inj	3 months	37		28.30 (24.85)		VAS, 4. Overall/others	
	Placebo	3 months	18		53.80 (33.80)		VAS, 4. Overall/others	

Grecco, 2013	ESWT+Exe	3 months	20		1.30 (1.84)		VAS, 2. Morning	
	Exe	3 months	20		1.85 (1.87)		VAS, 2. Morning	
	ESWT+Exe	12 months	20		0.80 (1.47)		VAS, 2. Morning	
	Exe	12 months	20		1.05 (1.82)		VAS, 2. Morning	
Guner, 2013	NSAID Inj+Exe	12 months	31		2.94 (2.04)		VAS, 4. Overall/others	
	Steroid Inj+Exe	12 months	30		3.17 (2.31)		VAS, 4. Overall/others	
Walther, 2013	Placebo	3 weeks	10		46.00 (33.90)		VAS, 4. Overall/others	
	Orthoses	3 weeks	20		17.95 (17.50)		VAS, 4. Overall/others	
Yucel, 2013	Steroid Inj	1 month	20	20	3.70 (1.45)	-74.60 (7.89)	VAS, 4. Overall/others	FAOS; ADL Subscale*
	Orthoses	1 month	20	20	4.65 (1.34)	-64.80 (6.32)	VAS, 4. Overall/others	FAOS; ADL Subscale*
McMillan, 2012	Steroid Inj+Exe	1 month	41	41	34.31 (25.47)	-70.73 (26.50)	VAS, 1. First-step	FHSQ; Function Subscale*
	Exe	1 month	40	40	44.79 (26.39)	-68.45 (26.55)	VAS, 1. First-step	FHSQ; Function Subscale*
	Steroid Inj+Exe	3 months	41	41	30.77 (29.93)	-78.66 (23.63)	VAS, 1. First-step	FHSQ; Function Subscale*
	Exe	3 months	40	40	37.34 (27.25)	-77.74 (22.62)	VAS, 1. First-step	FHSQ; Function Subscale*
Vahdatpour, 2012	ESWT	3 months	20		7.60 (0.70)		NRS, 3. Activity	
	Placebo	3 months	20		4.90 (1.60)		NRS, 3. Activity	
Biswas, 2011	Steroid Inj	1 month	60		1.09 (1.16)		VAS, 4. Overall/others	
	Oral NSAID	1 month	60		4.15 (1.18)		VAS, 4. Overall/others	
	Steroid Inj	2 months	60		1.92 (1.22)		VAS, 4. Overall/others	
	Oral NSAID	2 months	60		5.76 (1.62)		VAS, 4. Overall/others	
Ibrahim, 2010/2017	ESWT	1 month	25	25	0.60 (7.50)	1.20 (0.50)	VAS, 4. Overall/others	R&M
	Placebo	1 month	25	25	7.60 (2.00)	3.60 (0.50)	VAS, 4. Overall/others	R&M
	ESWT	3 months	25	25	1.10 (1.50)	1.40 (1.00)	VAS, 4. Overall/others	R&M
	Placebo	3 months	25	25	7.70 (1.00)	3.20 (1.00)	VAS, 4. Overall/others	R&M
	ESWT	12 months	25	25	2.30 (2.15)	1.90 (0.75)	VAS, 4. Overall/others	R&M
	Placebo	12 months	25	25	6.90 (3.20)	2.80 (1.20)	VAS, 4. Overall/others	R&M
Yucel, 2010	Steroid Inj	3 months	33		1.10 (0.90)		VAS, 4. Overall/others	
	ESWT	3 months	27		1.20 (1.10)		VAS, 4. Overall/others	
Chow, 2007	ESWT	5 weeks	17	17	3.72 (0.69)	8.89 (2.62)	VAS, 4. Overall/others	Total FFI
	Placebo	5 weeks	14	14	5.71 (1.07)	14.77 (1.72)	VAS, 4. Overall/others	Total FFI
	Exe	2 weeks	46	46	51.10 (29.10)	-72.40 (23.60)	VAS, 1. First-step	FHSQ; Function Subscale*

Radford, 2007	Placebo	2 weeks	46	46	62.50 (29.50)	-66.40 (26.20)	VAS, 1. First-step	FHSQ; Function Subscale*
Kudo, 2006	ESWT	3 months	53		3.90 (3.20)		VAS, 1. First-step	
	Placebo	3 months	52		5.30 (2.70)		VAS, 1. First-step	
Landorf, 2006	Orthoses	3 months	89	89	-71.60 (21.90)	-82.95 (21.35)	FHSQ; Pain Subscale, 4. Overall/others*	FHSQ; Function Subscale*
	Placebo	3 months	44	44	-63.40 (21.50)	-79.70 (22.30)	FHSQ; Pain Subscale, 4. Overall/others*	FHSQ; Function Subscale*
	Orthoses	12 months	88	88	-83.45 (19.70)	-89.85 (18.40)	FHSQ; Pain Subscale, 4. Overall/others*	FHSQ; Function Subscale*
	Placebo	12 months	43	43	-82.30 (18.00)	-87.80 (20.60)	FHSQ; Pain Subscale, 4. Overall/others*	FHSQ; Function Subscale*
Porter, 2005	Steroid Inj+Exe	3 months	64		1.48 (1.75)		VAS, 2. Morning	
	ESWT+Exe	3 months	61		3.69 (2.00)		VAS, 2. Morning	
	Steroid Inj+Exe	12 months	64		0.84 (1.75)		VAS, 2. Morning	
	ESWT+Exe	12 months	61		0.84 (1.00)		VAS, 2. Morning	
Theodore, 2004	ESWT	6 weeks	72		4.60 (3.10)		VAS, 1. First-step	
	Placebo	6 weeks	71		5.00 (3.00)		VAS, 1. First-step	
	ESWT	3 months	73		3.40 (2.70)		VAS, 1. First-step	
	Placebo	3 months	73		4.10 (3.10)		VAS, 1. First-step	
Haake, 2003	ESWT	6 weeks	129		5.20 (3.10)		VNRS, 2. Morning	
	Placebo	6 weeks	131		4.90 (3.10)		VNRS, 2. Morning	
	ESWT	3 months	127		4.00 (3.20)		VNRS, 2. Morning	
	Placebo	3 months	129		4.50 (3.40)		VNRS, 2. Morning	
	ESWT	12 months	112		1.50 (2.60)		VNRS, 2. Morning	
	Placebo	12 months	114		1.70 (2.40)		VNRS, 2. Morning	
Rompe, 2003	ESWT	12 months	16	16	1.50 (1.70)	-90.40 (8.30)	VAS, 1. First-step	AOFAS Ankle-Hindfoot Scale*
	Placebo	12 months	19	19	4.40 (1.70)	-75.40 (17.30)	VAS, 1. First-step	AOFAS Ankle-Hindfoot Scale*
Buchbinder, 2002	ESWT	6 weeks	80	80	52.80 (34.50)	-65.60 (18.70)	VAS, 2. Morning	Maryland Foot Score*
	Placebo	6 weeks	81	81	47.40 (34.20)	-66.60 (17.60)	VAS, 2. Morning	Maryland Foot Score*
	ESWT	3 months	79	79	48.80 (35.40)	-69.90 (20.00)	VAS, 2. Morning	Maryland Foot Score*

	Placebo	3 months	81	81	44.40 (34.20)	-67.20 (20.20)	VAS, 2. Morning	Maryland Foot Score*
Crawford, 1999	Steroid Inj	1 month	27		2.90 (2.50)		VAS, 4. Overall/others	
	Placebo	1 month	27		4.00 (2.90)		VAS, 4. Overall/others	
	Steroid Inj	3 months	27		3.60 (2.80)		VAS, 4. Overall/others	
	Placebo	3 months	27		3.70 (3.30)		VAS, 4. Overall/others	

Abbreviations: ESWT=Extracorporeal shockwave therapy, ESWT+Exe= Extracorporeal shockwave therapy combined with exercise, ESWT+Orth= Extracorporeal shockwave therapy combined with orthoses, Exe=exercise, NSAID Inj+Exe=oral nonsteroidal anti-inflammatory drug combined with exercise, Oral NSAID=oral nonsteroidal anti-inflammatory drug, Orthoses=prefabricated or customised foot orthoses, Placebo=usual care/placebo, Steroid Inj=corticosteroid injection, and Steroid Inj+Exe=corticosteroid injection combined with exercise, n_pain= number of participants at follow-up for pain outcomes, n_function= number of participants at follow-up for function outcomes, SD= standard deviation, VAS=visual analogue scale, NRS=numerical rating scale, FHSQ=foot health status questionnaire, VNRS=verbal numerical rating scale, FFI=foot function index, AOFAS=American orthopaedic foot and ankle society, FAAM=foot and ankle ability measure, R&M=Roles and Maudsley score, FADI=foot and ankle disability index, FAOS=foot and ankle outcome score, ADL=activities of daily living.

* Direction of scale reversed by multiplying mean outcome values by -1 (to ensure all outcomes are interpreted with lower values indicative of improvements in pain or functional disability)

PHP NMA Appendix II

Table 1: Summary of Findings from Studies that were not included in the network meta-analysis

Treatment Comparison	Trials/ Population	Estimates of treatment effects		Comment/quality of evidence
		Pain	Function	
ESWT v placebo	**11 trials:** Gerdesmayer 2008 Gollwitzer 2015 Gollwitzer 2007 Ogden 2004 Rompe *1996* Speed 2003 Haupt/Straub 2002 Malay 2006 Cosentino 2001 Marks 2013 Marks 2008	**Short term**: evidence not available in 8 trials. 2 trials, found ESWT statistically significantly superior to placebo, with mean resting heel pain (VAS) of 4.49 compared to 15.23 (p† < 0.01) (t=6 weeks)/ 6.0 compared to 8.3 (note: figures estimated from graphs) (p† < 0.0001) (t=4 weeks). 3rd trial found no statistically significant difference between ESWT and placebo, with mean change in heel pain compared to baseline (visual analogue scale) of -2.23 compared to -2.12 (p† = 0.79, two-sided) (t=4 weeks) **Medium term**: evidence not available in 4 trials. 3 trials found no statistically significant difference between ESWT and placebo, e.g., % success rate* for first steps pain (VAS) 60.80% compared to 48.31%/ *37% compared to 36% (t=3 months)* 4 trials found ESWT statistically significantly better than placebo, e.g., mean change in heel pain compared to baseline (VAS) of -3.39 compared to -1.78 (p† < 0.001, two-sided) (t=3 months) and mean heel pain (VAS) of 3.43 compared to 4.28 (p† = 0.014) (t=3 months)/ 4.0 compared to 8.5 (note: figures estimated from graphs) (p† < 0.0001) (t=3 months). *Dichotomous outcomes: % success rate* of 50.4% compared to 36.4% (p† = 0.0136, one-sided) (t=3 months) **success rate defined by >60% decrease in visual analogue score compared to baseline* **Long term**: evidence not available in 4 trials: Rompe 1996 did not report placebo outcome and p value not reported so cannot compare. 2 trials found no statistically significant difference between ESWT and placebo e.g., mean change in pain (VAS); ESWT, -28.25 (26.06); placebo, -1.78 (44.42) (t=6 months) 3 trials found ESWT better than placebo, with e.g., % success rate* of 61.60% compared to 47.46% (p† = 0.0144, one-sided) (t=12 months); mean morning heel pain (VAS) of 1.41 compared to 3.54 (t=12 months)/ 1.5 (1.7) compared to 4.4 (1.7) (p† < 0.0001) (t=12 months) and 3.3 (0.8) compared to 4.7 (0.8) (t=12 months)	**Short term**: No evidence **Medium term**: No evidence in 9 trials 2 trials found ESWT to be better than placebo. E.g., % "excellent" or "good" (RMS) of 58.40% compared to 41.52% / 60.8% compared to 37.2% / 60% compared to 40% (t=12 weeks). 1 trial found ESWT better than placebo based on mean values at follow up: 90.4 (8.3) compared to 75.4 (17.3) (p† = 0.0211) (t=12 months) on AOFAAS scale** *** AOFAAS scale- American Orthopaedic Foot and Ankle Society's Ankle-Hindfoot Scale: higher scores indicate greater functional ability*	Uncertainty in evidence across trials and time points. ESWT appears better than placebo. Trials assessed as mostly unclear and high risk of bias on assessment.
Exercise v ESWT	**1 trial:** $Rompe 2010	**Short term**: No evidence **Medium term**: Exercise found to be better than ESWT, mean change in first step pain: -4.5 (2.4) compared to -1.8 (2.0) (t=2 months) **Long term**: No statistically significant difference between exercise and ESWT, mean change first step pain: -5.8 (2.3) compared to -5.9 (2.6) (t=15 months).	**Short term**: No evidence **Medium term**: Exercise better than ESWT, mean change in first step pain: -21.4 (10.6) compared to -6.6 (1.2) (p† < 0.001, t=2 months) **Long term**: No statistically significant difference between exercise and ESWT, mean change first step pain: -29.1 (12.8) compared to -28.9 (12.3) (p† = 0.950, t=15 months)	Exercise appears to confer more benefits compared to ESWT in the medium term. Beneficial effects was not sustained in the longer term? Uncertain evidence from only 1 trial

				Unclear risk of bias on most ROB items.
Custom orthosis v prefabricated orthosis/placebo	**2 trials:** Martin 2001 Wrobel 2015	**Short term**: 1 trial found no difference the mean first step pain score among for custom orthosis, 3.4; prefabricated orthosis, 3.9; placebo, 3.6. (p† < 0.65; t=4 weeks) **Medium term**: the 2 trials found no difference between custom orthosis and prefabricated orthosis. E.g mean first steps pain: custom orthosis, 2.6; prefabricated orthosis, 2.5; placebo, 2.9 / mean change of 5.3 in both groups (t=3 months). **Long term**: No evidence found.	Evidence from a single trial: **Short term**: No statistically significant difference between custom, 62.0 and prefabricated 67.4 or placebo 59.4 orthosis (t=4 weeks). **Medium term**: No statistically significant difference between custom, 57.2 and prefabricated 65.1 or placebo 62.4 (p† < 0.77, t=12 weeks). **Long term**: No evidence	No difference between custom or prefabricated orthosis. Agrees with evidence from network. Unclear risk of bias on assessment.
Exercise + ESWT + prefabricated orthosis v ESWT + prefabricated orthosis	**1 trial:** $Rompe 2015	**Short term**: No evidence **Medium term**: ESWT + prefabricated orthosis better with exercise than without exercise. Mean change of -4.0 (1.5) compared to -1.8 (2.0) (p† < 0.001, t=2 months) **Long term**: Differences were not statistically significant at t=24 months. Mean change for first step pain: -5.1 (2.5) compared to -4.2 (2.5) (p† < 0.05)	**Short term: No evidence** **Medium term:** ESWT + prefabricated orthosis better with exercise than without exercise. Mean change of -20.1 (7.8) compared to -12.2 (6.3) (p† < 0.001, t=2 months) **Long term:** ESWT + prefabricated orthosis better with exercise than without exercise at t=24 months. Mean change : -35.8 (11.0) compared to -27.6 (13.8) (p† < 0.01) .	Uncertain evidence from only 1 trial Unclear/low risk of bias.
Exercise + custom orthosis v exercise + prefabricated orthosis v exercise	**1 trial:** Pfeffer 1999	**Short term**: No evidence **Medium term**: No statistically significantly difference between the interventions (p† < 0.35) mean change (95% confidence interval) for pain compared to baseline: exercise + custom orthosis, -19.0 (-29.2, -8.7); exercise + prefabricated orthosis, -23.3 (-27.9, -18.6); exercise, -15.8 (-26.4, -5.1) (t=2 months) **Long term**: No evidence	No evidence for function in **short, medium or long term** follow up	Uncertain evidence from only 1 trial. Unclear/high risk of bias
Steroid injection v prefabricated orthosis v steroid injection + prefabricated orthosis	**1 trial:** Kriss 2003	**Short term**: Based on mean change in heel pain (VAS) compared to baseline; steroid injection, -65.3 (23.7) appears better than steroid injection + prefabricated orthosis, -49.3 (31.4) or prefabricated orthosis alone -20.3 (26.1); (p† < 0.001, t=4 weeks) **Medium term**: Based on mean change in heel pain (VAS) compared to baseline; steroid injection, -61.7 (28.2); appears better than steroid injection + prefabricated orthosis, -51.4 (31.1) or prefabricated orthosis alone -38.6 (30.6); (p† < 0.05, t=12 weeks) **Long term**: No statistically significant difference (p† = 0.10) between the three interventions in mean change (standard deviation) in heel pain compared to baseline (visual analogue score); steroid injection, -63.7 (31.4); prefabricated orthosis, -50.6 (28.6); steroid injection + prefabricated orthosis, -61.3 (27.2) (t=6 months)	No evidence for function in **short, medium or long term** follow up	For pain only, addition of prefabricated orthosis does not confer benefits on pain reduction. Uncertain evidence from only 1 trial. Mostly unclear/high risk of bias on assessment.

† *p value testing for a difference between three treatment groups (in mean change from baseline). Statistical significance level not declared.*
$ mean change (standard deviation) in total Foot Function Index sum score compared to baseline

Table 2: Characteristics of studies excluded from analysis n=28

Author/ Yr	**Country**	**Study setting**	**Diagnosis/ Inclusion criteria**	**Sample size**	**mean age Intervention/control arm ± SD**	**Mean Duration of symptoms (weeks)**	**Intervention description & dose / No of sessions/ Duration of treatment :**	**Control description & dose / No of sessions/ Treatment duration:**	**Delivered by?**	**Comments: Reasons for exclusions Co-interventions**
DiGiovanni 2003/2006	USA	Outpatient	Proximal plantar fasciitis. Failed previous treatments	101	44.6±NR 47.1±NR	Unclear	Exercise: Plantar fascia stretching with Ten second hold and repeat 10 times x 3/ day Duration of treatment: Unclear	Exercise: Achilles tendon stretching: with Ten second hold and repeat 10 times x 3/ day	Patient: self-administered?	Wrong outcome data (only change scores presented, and no baseline outcomes). Both groups received over the counter insoles, a 3-week course of NSAIDS and an educational video about plantar fasciitis
Dogramaci 2010	Turkey	Secondary care	Plantar fasciitis > 6 months,	50	51.8± 9.1 52.7± 7.6	60	Type of shockwave? appliction of 1 000 pulses under local anaesthetic (5ml of 2% prilocaine)	Placebo: Sham ESWT with injection of local anaesthetic only	Unclear	Wrong intervention. Classified not to be clinically like the ESWT interventions? Patients in both groups were allowed to take analgesic medication (Paracetamol 500 mg) three times daily for 3 days
Gerdesmayer 2008	USA/ Europe	Secondary care	Plantar fasciitis > 6 months failed previous treatments	252	52.4± 12 52±10.5	102	ESWT: 3 applications of 2 000 waves to the point of maximal tenderness at 0.16J/mm2 over 6 wks	Placebo: Sham ESWT, 3 applications over 6 wks	Orthopaedic surgeon or podiatrist	Wrong outcome data (only useful outcome data for extraction was for binary function).
Gollwitzer 2015	USA	Secondary care	Plantar Fasciitis > 6 months failed previous treatment	250	50±11.2 47.4± 10.6	Unclear	ESWT: 3 applications of ESWT 2 000 waves to the point of maximal tenderness at 0.25 mJ/mm2 over 3 weeks	Placebo: Sham ESWT. 3 sessions over 3 wks	Unclear	Wrong outcome data (only useful outcome data for extraction was for binary function). All: Pts allowed up to 2g of acetaminophen
Gollwitzer 2007	Germany	Secondary care	Chronic Painful Heel Syndrome > 6 months failed previous treatment	40	53.9± 12.5 58.9± 10.9	50	ESWT: 3 applications of ESWT 2 000 waves to the point of maximal tenderness at 0.25 mJ/mm2 over 3 weeks	Placebo: Sham ESWT. 3 sessions over 3 wks	Unclear	Wrong outcome data (only change scores presented, and no measure of variability). All: Pts allowed up to 2g of acetaminophen
Greve 2009	Brazil	Hospital/ Rehabilitation	Plantar Fasciitis pain > 3 months,	32	NR	NR	ESWT: 3 applications of ESWT 2 000 waves, 6Hz and pressure of 3 bar to the point of maximal	Placebo/Usual care: 10 sessions of Physiotherapy incorporating Ultrasound	ESWT by Physician Usual care by Physiotherapist	Early results of Grecco 2013. All: Stretching for the calf and plantar fascia at home

			fascia thickness > 4mm.				tenderness at 0.25 mJ/mm2 over 3 weeks	(1Hz, intensity 1.2 W/cm2) and stretching over 5wks		
Martin 2001	USA?	Unclear	Plantar fasciitis	255	47±13 48±11	20 (median)	custom orthoses: rigid 5mm polydur plastic material	prefabricated orthoses: Over-the-counter arch supports.	Podiatrist	Wrong outcome data (only change scores presented, and no measure of variability). All: Taping for 2 weeks using a Low Dye technique
Ogden 2004	USA	Outpatient	Chronic plantar fasciitis >/6 months. Failed conservative treatments >5/10 (VAS)	293	Unclear	NR	ESWT: Electrohydraulic 100 graded shocks (14 to 18 kV; 0.12 to 0.22 mJ/mm2) followed by 1400 shocks at 18 kV (0.22 mJ/mm2) for a total of 1500 shocks, applied at 2 Hz. Total energy at 324.25 J.	Placebo: SHAM ESWT with Styrofoam block Co-intervention:	NR	Wrong outcome data (only point estimates reported, without a measure of variability). All: Anaesthesia with lidocaine prior to procedure Self-treatment with over-the-counter analgesics or anti-inflammatory medications was permitted and documented
Porter 2002	USA	Outpatient	Painful Heel Syndrome	94	45.4±11.1 45.9±12.1	50/94?	Exercise: Sustained stretching of Achilles tendon 3x daily, 3 minutes for 17 weeks following 1 instruction session by physiotherapist	Exercise: Intermittent stretching of Achilles tendon 2x daily, 20 second intervals for 3 minutes, over 17 weeks.	physiotherapist	Wrong interventions (too similar to separate into different nodes). No other treatments
Rathleff 2015	Denmark	Outpatient	Plantar fasciitis Inferior heel pain >3 months, pain in palpation, thickness plantar fasciitis >4.0 min	48	47±7 45±8	30	Exercise 12 repetitions, 3 sets of high load strength training. Increasing load, with reducing no. of reps over 13 weeks	Exercise: 10 Stretching repetitions 3x per day, for 13 weeks	physiotherapist	Wrong interventions (too similar to separate into different nodes). All: information & advice for home exercise plus gel heel inserts
Rome 2004	UK	Unclear	Plantar heel pain (Unilateral); >2 months	48	61.2±14.4 58.3±12.6	median 26	Orthoses: Functional foot orthoses, made of ethyl venyl acetate to achieve weight bearing realignment of foot and lower limb,	Orthoses Accommodative foot orthoses, made of low-density ethyl venyl acetate; polyurethane heel pad to provide cushioning,	Researcher	Wrong interventions (too similar to separate into different nodes). All: written and graphic information about stretching programme

							redistribution of load, shock absorption in gait over 8wks	padding, shock absorption over 8 wks.		
Rompe ***1996***	Germany	Outpatient	radiologically proven heel spur; >12 months; unsuccessful conservative or surgical in previous 6 months	30	47±NR 51±NR	78	ESWT: 3 applications of 1000 impulses of 0.06mJ/mm, radius 1.5-2cm over 3 wks.	Placebo: 3 applications of Sham ESWT over 3 wks	NR	Wrong outcome data (only point estimates reported, without a measure of variability). No other treatment
Rompe 2005	Germany	Outpatient	chronic plantar fasciitis moderate-severe pain; > 6 months; failed multiple conservative treatments (n=4); treatment-free interval of 6 weeks before EWST	86	48±NR 50±NR	65-74	ESWT 3 applications of 2000 impulses of 0.09mJ/mm2 plus local anaesthetic over 3 weeks.	Placebo: 3 applications of sham EWST, without local anaesthetic in 3 weeks	physician	Wrong outcome data (only change scores presented (mean and 95% confidence interval). rescue pain medication and insoles allowed.
Rompe 2010	Germany	Outpatient	plantar fasciopathy duration <6 weeks; NRS >6;	102	53.1±NR 49.8±NR	~3.8	Exercise: plantar fascia specific stretching: 10 exercise repetitions at 10 sec hold interval 3 times daily. 1 instruction session, contacted by phone every 2 weeks for 8 wks	ESWT: 3 Sham shockwave device for 3 weeks	physician	Wrong outcome data (only change scores presented (mean and standard deviation). Rescue pain medication
Rompe 2015	Germany	Outpatient	chronic plantar heel pain, >12 months, at least 3 failed conservative	152	51.2±NR 52±NR	70 - 78	Exercise + ESWT: Plantar fascia specific stretching (10 exercise repetitions at 10 sec hold interval 3 times daily) +	ESWT: 3 applications of 2000 pulses, 0.16mj/mm2 over 3 wks.	physician	Wrong outcome data (only change scores presented (mean and standard deviation).

			treatments, no surgery.				EWST 2000 pulses, 0.16mj/mm2 1 instruction session, contacted by phone every 2 weeks for 8 wks.			All: Rescue pain medication. Heel pads and advice to continue activities as normal.
Speed 2003	England	Outpatient	Plantar fasciitis (unilateral); > 3mths	88	51.7± NR 52.5± NR	60?	ESWT: 3 applications of Electromagnetic 1500 pulses at 0.12 mJ/mm^2 over 8 weeks.	Placebo: 3 applications of Sham ESWT with deflated treatment minimal energy pulses (0.04 mJ/mm^2) over 8 wks.	NR	Couldn't extract any useful outcome data. No other treatments allowed.
Haupt/ Straub 2002	Germany	Unclear	plantar calcaneal tendoperiostitis > At least 6 mth history, with at least 2 different unsuccessful attempts of conservative trt.	103	50.46?	96?	ESWT: Up to 3 applications of 2000 shockwaves over 4 weeks	Placebo: Sham ESWT identical to active treatment	NR	Couldn't extract any useful outcome data (given in the form of graphs only). Treatments carried out with or without anaesthesia based on pt preference.
Kamonseki 2016	Brazil	Unclear	Plantar fasciitis (bilateral) >30 days	83	45.2± 12 44.5± 11.5	73.2	Exercise: daily stretching & bi-weekly strengthening exercises for 8 wks	Exercise Foot exercises (daily stretching exercises only). for 8 weeks.	Physiotherapist (for bi-weekly sessions.	Wrong interventions (too similar to separate into different nodes).
Kriss 2003	England	Unclear	unilateral heel pain. anti-inflamm med stopped 6 weeks before inclusion.	76	59.33±NR	32.73	Steroid Injections: 1 Triamcinolone Hexacetonide 20mg/ml.	Orthoses: Soft anti-pronatory pad	NR	Wrong outcome data (only change scores presented (mean and standard deviation). Intervention 3: combination of steroid injection and orthoses (exactly as in interventions 1 and 2)
Liang 2007	Taiwan	Outpatient	Plantar fasciitis. > 6 months, failed previois conservative treatments. >3 months since	53	47±11 52.1±9.7	NR	ESWT 3 applications of Low intensity piezoelectric shockwave of 2000 impulses at 0.12 mJ/mm^2 over 2 weeks.	ESWT High intensity piezoelectric shockwave 3 applications of Low intensity piezoelectric shockwave of 2000	NR	Wrong interventions (too similar to separate into different nodes).

			previous steroid injection (if any).					impulses at 0.56 mJ/mm^2 over 2 weeks.		
Lohrer 2010	Germany	Unclear	Plantar fasciitis/ Heel spur > 3 months failed conservative trts, VAS>5, R&M score of 3 or 4	39	45±NR 52±NR	NR	ESWT: 3 applications of 2000 Shockwave impulses (freq=10Hz), 0.20 mJ/mm^2 over 2 weeks	ESWT: 3 applications of 2000 Shockwave impulses (freq=10Hz), 0.17 mJ/mm^2 over 2 weeks	Physician	Wrong outcome data (only point estimates reported, without a measure of variability).
Malay 2006	US	Unclear	Plantar fasciitis (proximal) > 6 mths, failed previous conservative treatments, VAS score > 5	172	50.8±10.1 52.1±11.1	130	ESWT: 1 application of 3800 shockwaves (150 shock/min). for 25 minutes.	Placebo: Sham shockwave with Foam-insulated membrane.	unblinded investigator?	Wrong outcome data (only change scores presented, and no measure of variability).
Pfeffer 1999	USA?	Unclear	Proximal plantar fasciitis	236	48.5± NR 49.5±NR	unclear	custom orthoses: polypropylene neutral orthosis	prefabricated orthoses: silicone heel pad	NR	Wrong outcome data (only change scores presented (mean and standard deviation). Int 3: pre-fabricated orthoses; rubber heel cup Int 4: pre-fabricated orthoses; a felt insert All: Stretching exercises (all five groups
Wrobel 2015	USA	Unclear	Plantar heel pain/plantar fasciitis < 1 yr	77	47.1± NR 51.3± NR	21	custom orthoses: Standard prescription with accommodations for body stature, foot data, first-ray and ankle function worn for 12 wks	prefabricated orthoses: full foot–length, triplanar orthotic footbed with a 15-mm heel cup for 12 wks	senior experienced biomechanics instructor	Wrong outcome data (only point estimates reported, without a measure of variability). Group 3: sham orthoses: fabricated by certified pedorthist. All treated with removable longitudinal and metatarsal pads for the 7-14 day period before orthosis arrival plus standardized athletic shoes and standardized foot self-care advice

Cosentino 2001	Italy	Hospital/ Rehabilitation	Calcaneal ethesophytosis Pain over heel spur / unsuccessful conservative treatment >six months before referral to our hospital.	60	NR	~34	ESWT: 6 applications of 1200 shocks with a frequency of 120 shocks/min; at varied energy density from 0.03 to 0.04 mJ/mm2 over 8-9weeks.	ESWT: 6 applications of 1200 shocks with a frequency of 120 shocks/min; at 0 mJ/mm2 energy density?	NR	Wrong outcome data (only point estimates reported, without a measure of variability). Only use of insole supports was permitted.
Marks 2013										Couldn't extract any useful outcome data (given in the form of graphs only).
Marks 2008	Unclear (Poland)	Unclear	Plantar fasciitis	25	51.9±11.9 51.7±14.3	113.2	ESWT: 3 applications of 500 Shockwave impulses for the 1st session, then 2000 shock waves in two further sessions, at 3 days' intervals. Energy density was 0.16 mJ/mm2.	Placebo: Sham ESWT. As intervention group but energy density reduced almost to zero	Orthopaedic surgeon	Wrong outcome data (only change scores presented (mean and standard deviation).
Baldassin 2009	Brazil	Hospital/Rehabilitation	Plantar fasciitis (non-complicated PF)	142	47.5 ± 11.5 47.2 ± 12.4	NR	Prefabricated orthoses: made from 95% EVA, worn for 8 weeks.	Custom orthoses: Made from 95% EVA worn for 8 weeks	Principal Investigator	Wrong interventions (too similar to separate into different nodes).

NR: Not Reported
?: Data given but unclear/could not be verified