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Effects of therapeutic interventions on pain due to plantar fasciitis: A systematic review and meta-analysis

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Abstract

Objective: To determine the effects of different therapeutic interventions that have ever been evaluated in randomized controlled trials on pain due to plantar fasciitis.

Methods: We searched different electronic databases until September 2022. Mean differences (MDs) and 95% confidence intervals (CIs) were calculated. The Grading of Recommendations Assessment, Development and Evaluation was used to evaluate the overall certainty evidence.

Results: A total of 236 studies met the study criteria, including 15,401 patients. Botulinum toxin MD −2.14 (CI: −4.15, −0.14), micronized dehydrated human amnion/chorion membrane injection MD −3.31 (CI: −5.54, −1.08), dry needling MD −2.34 (CI: −4.64, −0.04), low-dye taping MD −3.60 (CI: −4.16, −3.03), low-level laser therapy MD −2.09 (CI: −2.28, −1.90), myofascial releases MD −1.79 (CI: −2.63, −0.94), platelet-rich plasma MD −2.40 (CI: −4.16, −0.63), radiofrequency MD −2.47 (CI: −4.65, −0.29), and stretching MD −1.14 (CI: −2.02, −0.26) resulted in being effective treatments for pain when compared to the control in the short term. In the medium and long term, only extracorporeal shock wave therapy MD −0.97 (CI: −1.13, −0.81)/MD −2.49 (CI: −3.17, −1.82) was effective for improving pain when compared to the control.

Conclusions: Considering the available studies, this systematic review and meta-analysis showed that different therapeutic interventions seem to be useful strategies for improving pain in patients with plantar fasciitis. In the medium and long term, only extracorporeal shock wave therapy was effective in improving pain when compared to the control.

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Background

Plantar fasciitis is the most common cause of pain in the heel. The pain may get better by itself without treatment and often improves with ambulation.[1–3] However, it can persist for months and be incapacitating, thus limiting daily activities.[2–4]

Many interventions have been described for treating plantar fasciitis pain. These include conservative, physiotherapy, pharmacological, steroid injections, and surgical interventions.[2,4,5] In accordance with the American College of Foot and Ankle Surgeons, non-steroidal anti-inflammatory drugs, other injection techniques, and other surgical techniques were neither appropriate nor inappropriate.[6] The American Physical Therapy Association suggested that different interventions have been described for the treatment of plantar fasciitis, but few high-quality randomized clinical trials have been conducted to support these therapies.[7] Thus, many treatment options currently exist, however, no consensus has been reached about the best treatment method.

Many systematic reviews and meta-analyses have been published on different types of therapeutic interventions in patients with plantar fasciitis.[2,3,5,8–10] In one of these systematic reviews, Babatunde et al.[10] concluded that the current evidence is equivocal regarding which treatment is the most effective for the management of plantar heel pain. Thus, a better understanding of the effects of different therapeutic interventions will enable people with plantar fasciitis and their healthcare providers to determine the most effective and appropriate intervention. In addition, to the best of our knowledge, there is no published systematic review with meta-analysis on the effects of all different types of therapeutic interventions (pharmacological, non-pharmacological, and surgical interventions). Thus, this systematic review expands on previous publications by performing a comprehensive systematic literature review with meta-analysis to investigate the effects of all different therapeutic interventions on pain for treating plantar fasciitis. This systematic review also will enable a summary of knowledge regarding the different therapeutic interventions used in patients with plantar fasciitis. Thus, the aim of this systematic review and meta-analysis was to investigate the effects of different types of therapeutic interventions on pain in patients with plantar fasciitis, helping the reader to choose the best intervention to be applied in their clinical practice.

Methods

The protocol was registered with the International Prospective Register of Systematic Reviews (PROSPERO; number: CRD42021237712). This meta-analysis was completed in accordance with Preferred Reporting Items for Systematic Reviews incorporating Network Meta-Analyses of Health Care Interventions (PRISMA) guidelines.[11]

We searched for references on Pubmed/MEDLINE, Cochrane Central Register of Controlled Trials (CENTRAL), PEDro database, SCOPUS, SCIELO, and Google Scholar up to September 2022 without language restrictions. A standard protocol for this search was developed, and whenever possible, controlled vocabulary (MeSH term for MEDLINE and Cochrane) was used. Keywords and their synonyms were used to sensitize the search.

The strategy developed by Higgins and Green[12] was used for the identification of randomized controlled trials in PUBMED/MEDLINE and CENTRAL Cochrane. To identify the randomized controlled trials in other databases, we adopted a search strategy using similar terms. For

the preparation of the search strategy, three groups of keywords were used: study design, participants, and interventions. The search strategy for MEDLINE via PUBMED and the Cochrane library via CENTRAL Cochrane is presented in Table E1 (Supplementary Material 1).

We checked the references used in the articles included in this systematic review to identify other potentially eligible studies. For ongoing studies, authors were contacted by email for confirmation of any data or acquisition of additional information.

This systematic review included randomized controlled trials that studied the effects of different types of therapeutic interventions on pain in patients with plantar fasciitis. To be eligible, the studies needed to have (a) patients with plantar fasciitis (aged ≥18 years) assigned to a group of one type of therapeutic intervention; (b) a randomized controlled trial design; and (c) any type of therapeutic intervention controlled by other intervention or compared to a placebo, no treatment or sham treatment. Therapeutic interventions included the following treatments: conservative, non-pharmacological (physiotherapy modalities), drugs, injection treatments, and surgical interventions. The main outcome of interest was pain measured by any standardized and validated analogical or numerical scales.

The previously described search strategy was used to obtain titles and abstracts of the studies. Each identified abstract was independently evaluated by two researchers. If at least one of the researchers considered one reference eligible, the full text was obtained for a complete assessment. Two researchers independently assessed the full text of selected randomized controlled trials to verify if they met the criteria for inclusion or exclusion. In case of any disagreement, the authors discussed the reasons for their decisions and a consensus was reached. Two authors independently extracted data from the published randomized controlled trials using standard data extraction forms adapted from Higgins and Green.[12] Any further information required from the original author was requested by email.

The risk of bias in included studies was assessed independently by two reviewers using the Cochrane Collaboration's Tool.[12] The following criteria were analyzed: selection bias (random sequence generation method and allocation concealment); performance bias (blinding of participants and personnel); detection bias (blinding of outcome assessment); attrition bias (incomplete outcome data); and reporting bias (selective reporting).[12,13] The quality of each item was classified using a nominal scale: "Yes" (low risk of bias), "No" (high risk of bias), or "Unclear" (unclear risk of bias).

In this systematic review, we performed fixed and random effects using mean differences (MDs). Studies that provided a point estimate of the outcome together with a measure of variability (e.g. a mean and SD) were taken forward for analysis. Where only range and/or interquartile range (IQR), median, the sample size were given, methodology from Higgins and Green[12] and Wan et al.[14] were used to calculate the sample mean and SD. When the SD of change was not available, but the confidence interval (CI) was, we converted CI to SD, as recommended by Higgins and Green.[12] Pooled-effect estimates were obtained by comparing the mean change from baseline to endpoint for each group. For continuous variables, results were expressed as the MD in the change in the variable between randomized groups. In multiple-arm studies, we extracted data from the arms of patients that satisfied the inclusion criteria. The primary outcome of pain was 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).[10] For short-term and medium-term outcomes, the latest outcome data within each time category were used for analysis. For example, if a study reported 3-week and 6-week pain outcomes, only the 6-week data were used.[10] Pain measures were placed in a hierarchy as follows: first-step pain, pain in the morning, pain on activity (e.g., walking), and overall pain (or other measures of pain). In accordance with Babatunde et al.,[10] this hierarchy is used to analyze the most clinically relevant data when multiple

pain outcomes were reported in a randomized controlled trial. All pain data were transformed into a range of 0 to 10.

Calculations were performed using a random-effects model. An α value of 0.05 was considered significant. Statistical heterogeneity of the treatment effect among studies was assessed using Cochran's Q-test and the inconsistency I^2 test. Values >40% were considered indicative of high heterogeneity.[15] Data were pooled for multiple studies in a meta-analysis within each group using a random-effects model. All analyses were conducted using Review Manager Version 5.3 (Cochrane Collaboration).[16]

The quality of evidence for the pain and disability outcomes was assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach to interpret result findings and using GRADEpro GDT 2015 to import data from a Review Manager to create a "Summary of findings table." The assessment involved five items: risk of bias, imprecision, inconsistency, indirectness, and publication bias.[12] The quality of evidence was downgraded by one level for risk of bias when more than a quarter of the studies included in the meta-analysis were considered at high risk of bias (studies without allocation concealment, random allocation, and/or sample size calculation). Results were considered imprecise if the pooled sample size was <300 for dichotomous or <400 for continuous outcomes, and inconsistent if the heterogeneity between randomized controlled trials was substantial (i.e. I^2 >40%). Where possible, publication bias was assessed by visual inspection of funnel plots (a scatter plot of the effect size from individual studies against its standard error) for the meta-analysis with 10 or more trials. Decisions to downgrade the quality of studies were justified using footnotes and making comments, where necessary, to aid readers' understanding of the review.

Results

The initial search led to the identification of 558 abstracts, from which 315 studies were considered as potentially relevant and were retrieved for detailed analysis. After a complete reading of 315 articles, 79 were excluded. Finally, 236 papers[17–252] met the eligibility criteria. Nineteen treatments were investigated in 236 randomized controlled trials. Figure 1 in Supplementary Material 2 shows the PRISMA flow diagram of the studies in this review. Figure 1 presents the risk of bias graph: review authors' judgments about each risk of bias item presented as percentages across all included studies.

Of the 236 studies, 176 studies compared two, three, or four different therapeutic interventions,

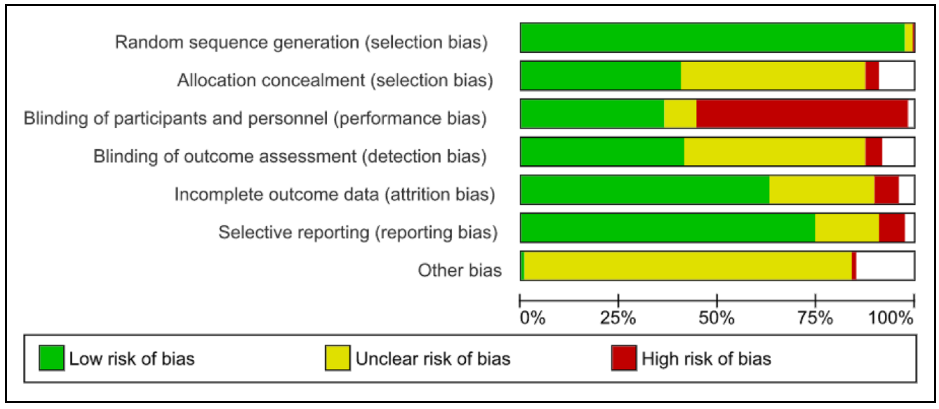

Figure 1. Risk of bias graph: review authors' judgments about each risk of bias item presented as percentages across all included studies.

and 60 studies compared a different therapeutic intervention versus control. The randomized controlled trials involving 15,401 participants across 51 different (combinations of) therapeutic interventions were distributed in the major groups. Table 1 shows the different interventions identified in the included studies. Of these studies, 60 arms compared a therapeutic intervention to control, 43 arms compared three or four different therapeutic interventions, and 137 arms compared two different therapeutic interventions.

The number of participants in the reviewed studies ranged from 11 to 293. The mean age of the participants ranged from 25 to 60 years. A total of 231 studies[17–19,21–53,55–112,114–137,139–191,193–252] included patients of both genders, three studies[54,138,192] included only women, and two studies[20,113] included only men. The

Table 1. Interventions studied in alphabetical order.

Major group	Interventions
Acupuncture[17–24]	Acupuncture[17–24]
Botulinum toxin[25–34]	Botulinum toxin[25–34]
Dry cupping[35,36]	Dry cupping[35,36]
Dry needling[37–42]	Dry needling[37–42]
Extracorporeal shock wave therapy[43–86]	Extracorporeal shock wave therapy[43–86] and intracorporeal pneumatic shock therapy[87]
Heat[88]	Heat[88]
Injection[89–111]	Allogeneic growth factor,[89] acetic acid,[90] cryopreserved human amniotic membrane (c-ham),[91] dehydrated human amnion/chorion membrane (dHACM),[92,93] dextrose prolotherapy,[94–98] hyaluronic acid,[99,100] local anesthetic with or without peppering,[101] polydeoxyribonucleotide,[102,103] steroid with or without ultrasound guidance,[104–110] and tenoxicam[111]
Low dye taping[112–119]	Low dye taping[112–119]
Low-level laser therapy[120–133]	Low-level laser therapy[120–133]
Neuromuscular electrical stimulation[134–138]	Neuromuscular electrical stimulation[134–138]
Non-steroidal anti-Inflammatory drug[139,140]	Non-steroidal anti-Inflammatory drug[139,140]
Orthoses/insoles[141–163]	Air heel,[152] ankle foot orthosis (AFO),[145] conventional shoe,[149] customized foot orthosis,[146–148,150–154] flexible shoe,[155] magnetic insole,[156,157] prefabricated arch supporting insole,[141–143,158–161] plain or sham insole[144,162,163]
Ozone injection[164,165]	Ozone injection[164,165]
Platelet-rich plasma/blood[166–192]	Autologous conditioned plasma,[166] autologous blood injection,[167–173] platelet-poor plasma,[179] and platelet-rich plasma[174–178,180–192]
Physical therapy modalities[193–231]	Chiropractic manipulation,[199] deep massage therapy to posterior calf muscles and neural mobilization,[200] exercise (foot, hip),[201] hi-load strength sraining,[202] joint mobilization/manual therapy,[196,203–210] myofascial release,[211–222] podiatric care,[233] strengthening,[193–195,224,225] plantar fascia stretching or muscle stretching[226–231]
Radiofrequency/radiation therapy[232–238]	Radiofrequency/radiation therapy[232–238]
Surgery[239–245]	Artificial intelligence and US guidance EPF release,[239] endoscopic plantar fascial release[240–243] or open plantar fascial release,[244] proximal medial gastrocnemius release surgery[245]
Tension night splint[246–249]	Tension night splint[246–249]
Therapeutic ultrasound[250–252]	Therapeutic ultrasound[250–252]

sample size, outcomes, intervention parameters, and key findings of the included studies are summarized in Table 2. The main characteristics of therapeutic interventions in the included studies are also provided in Table 2.

Meta-analysis

Pain in the short term

Ninety-four randomized controlled trials (5397 participants) assessed pain in the short term as an outcome. Of these, 51 randomized controlled trials (2937 participants) compared 14 different therapeutic interventions to the control group in the short term: acupuncture ($n = 69$[19,20,23]); botulinum toxin ($n = 161$[27,31,33,34]); corticosteroid injection ($n = 244$[107,108,168,186]); dry needling ($n = 215$[39,41,42]); extracorporeal shock wave therapy ($n = 863$[54,55,65,71,72,75,78,81,84,166]); low-dye taping ($n = 213$[106,115,119,231]); low-level laser therapy ($n = 231$[122,125,133,129,132]); micronized dehydrated human amnion/chorion membrane injection ($n = 175$[92,93]), myofascial releases ($n = 101$[212,214,215,222]); orthosis ($n = 259$[141,148,160,162]); platelet-rich plasma ($n = 110$[181,186]); radiofrequency ($n = 87$[236,237]); stretching ($n = 112$[230,231]); and therapeutic ultrasound ($n = 97$[250,251]). A summary of the meta-analysis performed to compare interventions versus controls is shown in Table 3.

In the pairwise meta-analysis, only nine of these interventions pairs had 95% CIs beyond the null value, which was considered to represent significant differences, as follows: low-dye taping versus control, micronized dehydrated human amnion/chorion membrane injection versus control, platelet-rich plasma versus control, radiofrequency therapy versus control, dry needling versus control, botulinum toxin versus control, low-level laser therapy versus control, myofascial releases versus control, and stretching versus control.

The GRADE assessments are presented in the summary of findings in Table 3. Compared to the control, the quality of evidence for pain with low-level laser therapy was assessed as moderate. For all other interventions compared to the control, the quality of evidence for pain was assessed as being low.

A summary of the meta-analyses performed to compare different interventions is shown in Table 4. Five studies[168–172] (306 participants) compared corticosteroid injection and autologous blood injection. The meta-analyses showed a significant improvement in pain for participants in the corticosteroid injection group versus the autologous blood injection group. Two studies[164,165] (74 participants) compared corticosteroid injection versus ozone therapy. The meta-analyses showed a significant improvement in pain for participants in the corticosteroid injection group versus the ozone therapy group. Two studies[158,161] (74 participants) compared corticosteroid injection versus orthosis. The meta-analyses showed a significant improvement in pain for participants in the corticosteroid injection group versus the orthosis group.

Nine studies[176,181,183,184,186,187,189,191,196] (511 participants) compared corticosteroid injection and platelet-rich plasma. The meta-analyses showed a non-significant difference in pain for participants in the corticosteroid injection group versus the platelet-rich plasma group. Five studies[50,52,58,62,183] (343 participants) compared extracorporeal shock wave therapy and corticosteroid injection. The meta-analyses showed a non-significant difference in pain for participants in the extracorporeal shock wave therapy group versus the corticosteroid injection group. Five studies[54,59,61,71,127] (174 participants) compared extracorporeal shock wave therapy and therapeutic ultrasound. The meta-analyses showed a non-significant difference in pain for participants in the extracorporeal shock wave therapy group versus the therapeutic ultrasound group. Four studies[122–124,127] (175 participants) compared extracorporeal shock wave therapy and low-level laser therapy. The meta-analyses showed a non-significant difference in pain for participants in the extracorporeal shock wave therapy group versus the low-level laser therapy group. Three studies[148,150,153] (304 participants) compared

Table 2. Characteristics of included studies.

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Ho et al., 2021	*N* = 80 85% F 59.7 ± 6.2/NR	Standardized EAWN therapy	No treatment	VAS FFI GRC	0.5, 01 (all groups), 02 (treatment group)	6/2	EAWN therapy can relieve pain and improve function in middle-aged and older adults with PHP. Therefore, it could be a valuable treatment alternative for this condition.
Wang et al., 2021	*N* = 92 54.34% 48.3 ± 11.5/1	EA	MA	VAS	06	12/4	Among patients with PHPS, EA did not have a better effect with respect to relieving pain intensity than MA at week 4, although both EA and MA appeared to have positive temporal effects, with decreased heel pain and improved plantar function.
Kumnerddee et al., 2012	*N* = 30 90% F 53 ± 9/6	Acupuncture	Conventional	VAS FFI	1.5	10/5	EA plus conventional treatments provided a success rate of 80% in chronic planar fasciitis which was more effective than conventional treatments alone. The effects lasted for at least six weeks.
Karagounis et al., 2011	*N* = 38 0% F 37 ± 4/ NR	Acupuncture	Control (conventional)	PFPS	01, 02	16/8	Acupuncture should be considered a major therapeutic instrument for the decrease of heel pain, combined with traditional medical approaches.
Zhang et al., 2011	*N* = 46 73.6% F 48 ± 2/6	Acupuncture PC 7	Acupuncture LI 4	VAS	01, 03, 06	10/2	Acupoint PC7 has a specific effect on the treatment of plantar fasciitis.

(Continued)

Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Liu et al., 2010	*N* = 66 NR% F NR/1	Acupuncture at GB39 + herbs	Common acupuncture + GB34, BL60, etc.	VAS	NR	NR/NR	The therapeutic effect of acupuncture at Xuanzhong (GB 39) combined with Chinese herbs pyrogenic dressing therapy on calcaneus spur is superior to that of common acupuncture.
Ebrahim et al., 2007	*N* = 23 39.1% F 44 ± 7/ NR	Group 1: EA + stretching and insole	Group 2: Stretching and insole Group 3: Insole	VAS ROM PPPD	02	24/8	The use of EA combined with Achilles tendon and plantar fascia stretch with prefabricated in-sole provides a highly significant reduction in pain and foot plantar pressure and an increase in ankle dorsiflexion range of motion. The study revealed that the use of prefabricated in-sole only is not beneficial in the treatment of plantar fasciitis.
Vrchota et al., 1991	NR/NR	Acupuncture	Sham acupuncture and conventional sports medicine therapy	NR	NR	NR/NR	NR
Ahadi et al., 2022	*N* = 35 NR% F NR/NR	BTX (flexor digitorum brevis and quadratus plantae)	Steroids injection (plantar fascia)	VAS FAAM Plantar fascia thickness	0.75, 03, 06	1/NA	Both ultrasound-guided botulinum toxin type A and corticosteroid injection were effective in the treatment of plantar fasciitis. Our study showed that the effects of botulinum toxin type A injection last longer than those of steroid injection.

(Continued)

Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Elizondo-Rodriguez et al., 2020	*N* = 60 57.7% F 46 ± 11/2	Group 1: BTX (plantar fascia)	Group 2: Steroids Group 3: Anesthetic	VAS MFS	0.5, 01, 03, 06	1/NA	No significant differences between the 3 injection therapies were observed. There was a sustained improvement in pain and functional outcomes in each of the treatment groups after 24 weeks. The unexpected outcome in the anesthetic group highlights the lack of a control group.
Abbasian et al., 2019	*N* = 28 35.7% F 46 ± 7/9	BTX (Gastroc)	Placebo	VAS, satisfaction, AOFAS	01, 03, 06, 12	1/NA	BTA injection appears to be effective in the treatment of CPF. When compared with the placebo group, BTA injection led to long-lasting pain alleviation and significant improvement of foot function in this patient population.
Ahmad et al., 2016	*N* = 50 72% F 49 ± 10/ 1.5	IBTA (plantar fascia)	Placebo	VAS FAAM	1.5, 03, 06, 12	1/NA	IBTA provided significant relief from dysfunction and pain due to plantar fasciitis compared with normal saline injection, and significantly lessened the need for patients to receive surgery for plantar fasciitis.
Roca et al., 2016	*N* = 72 73.6% F 52 ± 6/6	BTX (plantar fascia)	ESWT	VAS RMS	1	1/NA	The most important finding in our study was the superiority of ESWT over BoNT-A in the treatment of PF, in terms of control of pain. In two of the five pain scales used a significant difference was found, and in the other three scales, a tendency in favor of ESWT was also found.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Elizondo-Rodriguez et al., 2013	*N* = 36 55.5% F 43 ± 7/3	BTX (Gastroc)	Steroids	VAS FADI AOFAS	0.5, 01, 02, 04, 06	1/NA	A combination of BTX-A applications into the gastroc-soleus complex and plantar fascia stretching exercises yielded better results for the treatment of plantar fasciitis than intralesional steroids.
Peterlein et al., 2012	*N* = 40 80% F 52 ± 14/4	BTX (plantar fascia)	Placebo	VAS MPFS	0.5,1.5, 2.5, 3.5, 4.5	1/NA	Fan-shaped local injections with 200 units of BoNT-A (Dysport) on the origin of the plantar fascia may decrease the 6-week pain score (VAS) and 18-week pain intensity, but this was not statistically significant when compared with the placebo group in patients with refractory plantar fasciitis.
Díaz-Llopis et al., 2011	*N* = 56 66% F 53 ± 14 / 6	BTX (plantar fascia)	Steroid	FHSQ	01,06	1 or 2 (cross-over study after 1 month)/NA	Treatment of plantar fasciitis by injection with botulinum toxin type A shows better results at one month and particularly at six months compared to injection with corticosteroids in patients in whom conservative measures such as non-steroidal anti-inflammatory drugs, heel pads, insoles, and night splints have failed for at least six months.

(Continued)

Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Huang et al., 2010	*N* = 50 76% F 53 ± 7/3	BTX-A (plantar fascia)	Placebo	VAS US	0.75, 03	1/NA	Treatment of unilateral plantar fasciitis with BoNT-A led to significant pain relief and a reduction in the plantar thickness 3 weeks and 3 months post-injection, respectively.
Babcock et al., 2005	*N* = 27 66.6% F 43 ± 12 / 6	BTX (plantar fascia)	Placebo	VAS MFS	0.75, 02	1/NA	The injection of BTX-A into the plantar region significantly improves the pain of recalcitrant plantar fasciitis at both 3 and 8 weeks after treatment.
Alkhadhrawi et al., 2019	*N* = 71 43.6% F 42 ± 10/ NR	Dry cupping (Gastroc)	Exercise	VAS PPT ROM PSFS	2 days	1/NA	Adding dry cupping on calf MTrPs to self-stretching and ankle dorsiflexion exercises for patients with plantar heel pain was superior to only self-stretching and active ankle dorsiflexion exercises in pain, ankle dorsiflexion ROM, and plantar flexor strength.
Ge et al., 2017	*N* = 29 69% F 39 ± 14/ NR	Dry cupping (plantar fascia)	Electrical stimulation therapy	VAS PPT FAAM LEFS	Twice a week, 01	8/4	These results support that both dry cupping therapy and electrical stimulation therapy could reduce pain and increase function in the population tested.

(Continued)

Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Salehi et al., 2022	NR NR%F NR / NR	DN and stretching exercise	Stretching exercise	First step pain FAOS Plantar fascia thickness	0.5	NR/6	There were considerable differences between the two groups and the experimental group experienced more improvements in primary outcomes compared to the control group. These results suggest that the combination of DN and stretching exercises can be an effective conservative treatment for plantar fasciitis subjects.
Moosaei Saein et al., 2022	$N = 20$ 100% F NR/NR	DN	Control	VAS Range of motion Plantar fascia thickness	01	NR/NR	The result of this study showed that DN can reduce pain and plantar fascia thickness in women with PF who are suffering from trigger points of the gastrocnemius and soleus muscles.
Dunning et al., 2018	$N = 111$ 42.3% F $40 \pm 11/3$	DN	Control	NPRS LEFS FFI GROC	0.25, 01, 03	8/4	Patients with PF who received manual therapy, exercise, and ultrasound plus electrical DN experienced significantly greater improvements in first-step morning pain intensity, resting heel pain, pain during activity, function, related-disability and foot health-related quality of life, and medication intake as compared to the group that received manual therapy, exercise, and ultrasound alone.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Rastegar et al., 2018	*N* = 66 57.5% 40 ± 9/3	DN	Steroids	VAS	0.75,1.5, 03, 06,12	1/NA	Pain reduced gradually in dry-needled patients, and endpoint VAS scores were lower than in the steroid group, although rapid and short-term effects of steroid injection were also found.
Eftekharsadat et al., 2016	*N* = 20 65% F 5 0 ± 8/1	DN	Control	VAS FFI	01, 02	4/4	Trigger point DN by improving the severity of heel pain, can be used as a good alternative option before proceeding to more invasive therapies of plantar fasciitis despite its insignificant effect on the range of motion of the ankle joint.
Cotchett et al., 2014	*N* = 84 47% F 56 ± 12/1	DN	Sham DN	VAS FHSQ	0.5, 01, 1.5, 3	6/6	DN has some beneficial effects on the pain associated with this condition. However, therapists must consider whether this effect outweighs the elevated risk of immediate adverse events, even though these are mild and transitory.
Guzel et al., 2022	*N* = 51 70% F 51.06 ± 10.56/3	Group 1: High ESWT	Group 2: Medium ESWT Group 3: Low ESWT	VAS FFI Plantar fascia thickness	01	3/3	Neither low, medium nor high levels of ESWT were superior to one another in terms of pain, foot functions, fascia thickness, and pressure distribution in the treatment of plantar fasciitis.

(Continued)

Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Tognolo et al., 2022	*N* = 26 70% F 57 ± 13/3	ESWT on myofascial points	ESWT on the medial calcaneal tubercle	FAOS 17i-FFI	01, 04	3/3	Treatment of the myofascial points with ESWT in subjects suffering from plantar fasciitis fosters the hypothesis that a global biomechanical re-equilibrium of the body would be necessary to completely solve the pathology. ESWT on myofascial points could provide an interesting alternative with better outcomes in terms of time needed for recovery compared to traditional ESWT for the conservative management of PF.
Kesikburun et al., 2022	*N* = 29 69% F 54.3 ± 7.9/3	ESWT	Dextrose prolotherapy	VAS FFI RMS	1.5, 03	03 ESWT—sessions/02, 01 dextrose injection	Dextrose prolotherapy and ESWT had similar effectiveness in chronic plantar fasciitis for patients who have not responded to conservative care.
Gezginaslan et al., 2021	*N* = 94 73.4% F 45 ± 8.43/3	Group 1: 7 sessions of high ESWT	Group 2: 3 sessions of high ESWT Group 3: 7 sessions of low ESWT	VAS SF-36 FFI FACIT 6 MWT	01	7 H-ESWT/3 3 H-ESWT/1 7 L-ESWT/3	Our study suggests that H-ESWT for a high number of sessions is more effective than L-ESWT for a low number of sessions in patients with PF and high energy has a more important role than the number of sessions in ESWT.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Cinar et al., 2020	*N* = 44 90% F 45 ± 9.39/1	ESWT plus usual care	Usual care	AOFAS	03	3/3	The results revealed that ESWT did not have an additive benefit over usual care to improve foot function and walking performance in a patient with plantar fasciitis over three months post-treatment.
Bagcier et al., 2020	*N* = 40 72.5% F 43 ± 11/ 1.5	ESWT	ESWT + DN	VAS PPT FFI walking standing	01	3/3	ESWT and DN combination therapy in plantar fasciitis was seen to be superior in the pain scores.
Morral et al., 2019	*N* = 128 48% F 49 ± 11/6	Group 1: ESWT- standard device (appearance)	Group 2: ESWT-sophisticated device; Group 3: ESWT-Austere device	VAS FFI US (plantar fascia thickness)	01, 02, 04, 14	3/3	In patients with chronic plantar fasciitis treated with rESW therapy, the appearance of the device did not influence clinical outcomes: function, pain with the first weight-bearing step in the morning, pain during the day, fascia thickness, and adverse effects.
Xu et al., 2019	*N* = 96 70.8% F 47 ± 8/3	ESWT	Steroid	VAS FFI US (plantar fascia thickness)	01, 03, 06	3/3	For PF patients, both ESWT and LCI resulted in clinical improvement but EWST provided longer relief than LCI.
Çağlar Okur et al., 2019	*N* = 83 81.9% F 47 ± 9/ NR	ESWT	Custom-foot orthotics	VAS FFI	01, 03, 06	3/3	When we compared the two methods with each other, there was no superiority between the two methods in terms of short- and mid-term effects.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Lai et al., 2018	*N* = 97 55.6% F 54 ± 8/1	ESWT	Steroid	VAS 100-PSS	01, 03	2/3	ESWT is more efficacious than CSI in the treatment of plantar fasciitis in the 12-week assessment of VAS and 100-point score.
Vahdatpour et al., 2018	*N* = 40 82.5% F 49 ± 7/6	ESWT + steroid (topic)	ESWT	VAS RMS	01, 03	4/4	The study shows that a combination of ESWT with topical corticosteroid yielded earlier pain reduction and functional improvement than using shock wave alone; topical corticosteroid could enhance the effectiveness of shock wave in the short term in the treatment of recalcitrant plantar fasciitis.
Akinoğlu et al., 2017	*N* = 54 100% F 48 ± 7/3	Group 1: ESWT	Group 2: US therapy, Group 3: control (just exercise)	VAS FFI AOFAS	01	3/3	US therapy was found to be superior to r-ESWT treatment in reducing pain in PF. There was less improvement in the group receiving only exercise therapy when compared with the two other groups.
Ibrahim et al., 2017	*N* = 50 64% F 52 ± 16/6	ESWT	Placebo	VAS RMS	01, 03, 06, 12, 24	2/2	The use of rESWT in patients with cPF is effective and safe, leading to a significant, long-term reduction in pain, without adverse effects.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Njawaya et al., 2017	*N* = 47 80.4% F 52 ± 13/ NR	UG ESWT	Patient-guided (PtG) ESWT	VAS MFS (for PF) VISA-A (for CAT)	1.5, 03, 06	3 to 5/3 to 5	For calcific heel enthesopathy (PF and CAT), our study with moderate power found no difference between PtG and UG results of shock wave therapy in terms of pain or function outcome at 3 or 6 months of follow-up.
Yin et al., 2017	*N* = 278 48.9% F 55 ± 13/1	Group 1: ESWT-moderate intensity	Group 2: ESWT low-intensity; Group 3: ESWT-high intensity	VAS MCST RMS	03	3/2	The study establishes a new and accurate predictive model for the 36 efficacy of ESWT in managing patients with chronic plantar fasciitis. The use of these 37 parameters, in the form of a predictive model for ESWT efficacy, has the potential to 38 improve decision-making in the application of ESWT.
Eslamian et al., 2016	*N* = 40 82.5% F 42 ± 8/ NR	Steroid injection	ESWT	VAS FFI	01, 02	1/NA	Both radial ESWT and local corticosteroid injection treatments improved pain and functional ability 2 months after treatment.
Krukowska et al., 2016	*N* = 47 NR% F 51 ± 8/1	ESWT	US therapy	VAS LQ	0.25, 0.5	4/2	While ultrasound and shock wave therapy show significant analgesic efficacy in patients with heel spur, fewer shock wave therapy sessions are needed than ultrasound sessions for effective relief, suggesting that shock wave therapy has greater analgesic efficacy.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Gollwitzer et al., 2015	*N* = 246 70.3% F 48 ± 10/6	ESWT	Placebo	VAS RMS	03,12	3/3	Focused extracorporeal shock wave therapy applied in weekly interventions (totaling 3×2000 impulses, 0.25 mJ/mm^2) without local analgesia demonstrated relevant clinical effectiveness in the treatment of chronic plantar fasciitis.
Konjen et al., 2015	*N* = 30 NR% F NR / 3	ESWT	US therapy	VAS PFPS	0.25, 0.75, 1.5, 03, 06	6/6	In chronic plantar fasciitis treatment, both rESWT and US were found to be effective in reducing pain and increasing mobility; however, statistical analysis showed that rESWT is significantly more effective than US.
Mardani-kivi et al., 2015	*N* = 68 83.8% F 44 ± 8/ <1.5	ESWT	Steroid injection	VAS	03	1/NA	Both ESWT and CSI can be used as the primary and/or initial treatment option for treating patients with acute plantar fasciitis; however, the CSI technique had better therapeutic outcomes.
Rompe et al., 2015	*N* = 152 53.5% F 51 ± 13/ 12	ESWT	ESWT + Stretching	PS-FFI SROM	02	3/3	A program of manual stretching exercises specific to the plantar fascia in combination with repetitive low-energy radial shock waves was found to be superior to shock wave therapy alone for the management of chronically presenting plantar fasciopathy.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Moghtaderi et al., 2014	*N* = 40 65% F NR/6	ESWT-heel	ESWT-heel + Gastroc-soleus trigger points	VAS RMS	02	3 sessions per week/NR	The combination of ESWT for both plantar fasciitis and gastroc-soleus trigger points in treating patients with plantar fasciitis is more effective than utilizing it solely for plantar fasciitis.
Yan et al., 2014	*N* = 153 52.2% F 41 ± 8/ NR	Group 1: Orthosis-orthopedic insole	Group 2: Orthopaedic insole + ESWT; Group 3: ESTW	VAS	0.5, 01, 03	NR/2	Combining extracorporeal shock waves and orthopedic insoles, not only can restore diseased tissues, loosen adhesions, and restore both lower limbs normal biomechanics, but radically remove the cause of the disease in patients with plantar fasciitis.
Lohrer et al., 2010	*N* = 36 41% F 50 ± 9 / 3	RESWT	FESWT	FFI	0.5, 03	3/3	This study provides some evidence for focused extracorporeal shock wave treatment being superior to radial extracorporeal shock wave therapy for recalcitrant plantar fasciitis.
Rompe et al., 2010	*N* = 102 64.5% F 51 ± 12/ <1.5	Stretching	ESWT	PS-FFI	02, 04, 15	3/3	A program of manual stretching exercises specific to the plantar fascia is superior to repetitive low-energy radial shock-wave therapy for the treatment of acute symptoms of proximal plantar fasciopathy.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Yucel et al., 2010	*N* = 60 70% F 43 ± 8 / 6	ESWT	Steroid Injection	VAS HTI	03	1/NA	Corticosteroid injection and extracorporeal shockwave therapy are successful treatment modalities for plantar fasciitis. Corticosteroid injection treatment is cost-effective compared with extracorporeal shockwave therapy.
Gerdesmeyer et al., 2008	*N* = 243 68.3% F 52 ± 11/6	ESWT	Placebo	LVCF VAS COMP RMS SF-36	03,12	3/2	Radial extracorporeal shock wave therapy significantly improves pain, function, and quality of life compared with a placebo in patients with recalcitrant plantar fasciitis.
Marks et al., 2008	*N* = 25 56% F 51 ± 13 / 6	ESWT	Placebo	VAS RMS	06	3/1	There appeared to be a significant placebo effect with low-energy ESWT in patients with heel pain, and there was also a lack of evidence for the efficacy of ESWT when compared to sham therapy.
Cheing et al., 2007	*N* = 37 70.3% F 46 ± 7/3	Group 1: ESWT	Group 2: US therapy Group 3: control (no treatment)	VAS MCSS	0.5, 0.75, 1.5	3 and 9/3	Three sessions of extracorporeal shock wave therapy produced a greater reduction in heel pain than nine sessions of ultrasound therapy over a three-week period.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Gollwitzer et al., 2007	*N* = 40 62.5% F 56 ± 11/6	ESWT	Placebo	VAS RMS	1.5, 03	3/3	ESWT with 3 repetitive applications of 2000 impulses of an electromagnetic shockwave device without LA appeared to be an effective, noninvasive treatment modality for proximal plantar fasciitis.
Dorotka et al., 2006	*N* = 41 NR% F 54 ± 11/6	ESWT-guided by fluoroscopy	ESWT palpation-guided	VAS	1.5, 03	3/3	Despite the small number of patients in the study, patient location for positioning the focus in ESWT in the treatment of plantar fasciitis with a heel spur is recommended.
Kudo et al., 2006	*N* = 114 64% F NR/6	ESWT	Placebo	VAS AOFAS RMS SF-12	3–5 days,1.5 months, 03 months	1/NA	High-energy ESWT, administered with the Dornier Epos Ultra is a safe and effective treatment for patients who have failed previous conservative nonsurgical treatments for chronic plantar fasciitis.
Malay et al., 2006	*N* = 172 66.8% F 51 ± 10/6	ESWT	Placebo	VAS	01, 02, 03, 06, 12	1/NA	ESWT was both efficacious and safe for participants with chronic proximal plantar fasciitis that had been unresponsive to exhaustive conservative treatment.
Rompe et al., 2005	*N* = 86 59.5% F 49 ± 10/6	ESWT	ESWT + LA	NRS AOFAS	0.75, 03, 12	3/3	ESWT as applied should be done without LA in patients suffering from chronic heel pain. LA applied prior treatment reduced the efficiency of low-energy ESWT.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Ogden et al., 2004	*N* = 293 66.3% F 48 ± 11/6	ESWT	Placebo	VAS self-assess	2 days, 01, 02, 03, 06, 09, 12	NR/NR	The application of electrohydraulic high-energy shock waves to the heel is a safe and effective noninvasive method to treat chronic plantar fasciitis, lasting up to and beyond one year.
Theodore et al., 2004	*N* = 150 72.6% F 51 ± 12 / 6	ESWT	Placebo	VAS RMS	3–5 days, 1.5, 03, 06, 12	1/NA	Electromagnetically generated, high-energy shock waves administered with ultrasound guidance during a single therapeutic session can safely produce clinical improvement by 3 months post treatment.
Hammer et al., 2003	*N* = 47 68% F 49 ± 14/ NR	ESWT	Control (conventional treatment)	VAS	1.5, 03, 06, 24	3/3	At 12 weeks' follow-up after ESWT treatment, the first group had a 63% improvement. The second group was unchanged after the continuation of nonsurgical treatment. The second group then received ESWT and both groups were followed up at 2 years with 94% improvement in the first and 90% improvement in the second.
Rompe et al., 2003	*N* = 45 51.1% F 41 ± 8/12	ESWT	Sham	VAS AOFAS	06, 12	3/3	Three treatments with 2100 impulses of low-energy shock waves were a safe and effective method for the treatment of chronic plantar fasciitis in long-distance runners.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Speed et al., 2003	*N* = 88 58% F 52 ± 13/3	ESWT	Sham	VAS	03	3/8	There appears to be no treatment effect of moderate dose ESWT in subjects with plantar fasciitis. Efficacy may be highly dependent upon machine types and treatment protocols.
Hammer et al., 2002	*N* = 47 68% F 49 ± 14/ NR	ESWT	Control (conventional treatment)	VAS	1.5, 03, 06	3/3	No significant difference in pain and walking time after further non-ESWT treatment (three months) was seen. Six months after ESWT pain decreased by 64% to 88% on the visual analog scale (VAS) and the comfortable walking time had increased significantly in both groups.
Abt et al., 2002	*N* = 32 62.5% F 57 ± NR/ NR	ESWT	Placebo	VAS RMS	4.75; 08, 12	2/6	The results of this study corroborate the value of ESWT for recalcitrant plantar fasciitis. As a non-invasive technique with low side effects, it can complement the row of conservative treatments.
Buchbinder et al., 2002	*N* = 161 57.7% F 53 ± 12/ 1.5	ESWT	Placebo	VAS SF-36 MFS PET walking	1.5, 03	3/3	ESWT as applied in our randomized double-blind trial was no better than a placebo in the treatment of ultrasound-proven plantar fasciitis.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Rompe et al., 2002	*N* = 100 41.6% F 46 ± 10/6	ESWT (1000 impulses)	ESWT (10 impulses)	VAS RMS	06, 60	3/3	The therapy with three applications of 1000 impulses appeared to be a useful, noninvasive treatment method with negligible side effects that reduced the necessity for a surgical procedure.
Ogden et al., 2001	*N* = 256 65.9% F 49 ± 17/6	ESWT	Control (conventional treatment)	VAS	01, 02, 03	1/NA	This therapeutic modality should be considered before any surgical options, and even may be preferable to cortisone injection, which has a recognized risk of rupture of the plantar fascia and recurrence of symptoms.
Dogramaci et al., 2009	*N* = 50 44% F 52 ± 8/6	IPST	Placebo	VAS RMS	0.75, 06	1/NA	A pneumatic lithotripter may be used safely and effectively in the treatment of chronic PF, as an alternative to SWT devices before considering the surgery.
Petrofsky et al., 2020	*N* = 20 NR% F 49 ± 11/1	Heat	Sham	VAS PPT	4 hours	1/NA	The effect of single-cell heat on trigger points of the body on pain relief was significantly better in the heat groups than in the sham groups.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Kandil et al., 2020	*N* = 150 58% F 40.1 ± 6.85/1.5	Allogeneic growth factors (GFs) injection	Saline 0.9% injection	VAS FFI	01, 03, 06, 12	1/NA	This study provides level I evidence regarding the efficacy and safety of allogeneic GF injection in patients with plantar fasciitis. However, additional studies are needed to evaluate their adverse effects, immunogenicity, and microbiological safety.
Osborne et al., 2006	*N* = 31 45.9% F 51 ± 10/ NR	Group 1: LDT + acetic acid	Group 2: LDT + steroid Group 3: LDT + placebo	VAS	0.5, 01	1/NA	For the best clinical results at four weeks, taping combined with acetic acid is the preferred treatment option compared with taping combined with dexamethasone or saline iontophoresis.
Hanselman et al., 2015	*N* = 23 70% F 51 ± 9/3 to 12	c-hAM injection Steroid injection	Steroid injection	VAS FHSQ self	1.5, 03	1/NA	Cryopreserved hAM injection may be safe and comparable to corticosteroid injection for the treatment of plantar fasciitis. This is a pilot study and requires further investigation.
Cazzell et al., 2018	*N* = 145 57.9% F 50 ± 10/1 to 18	dHACM injection	Placebo injection	VAS FFI	01, 02, 03, 06, 12	1/NA	Treatment with micronized dHACM resulted in a statistically significant and clinically relevant reduction in pain and improved function.
Zelen et al., 2013	*N* = 45 64.6% F 52 ± 11/2 to 12	Group 1: 1.25 dHACM injection	Group 2: 0.5 dHACM injection Group 3: Placebo injection	FACES	0.25, 0.5, 0.75, 01, 1.25, 1.5, 02	1/NA	In patients with refractory plantar fasciitis, mDHACM is a viable treatment option. Larger studies are needed to confirm our findings.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Raissi et al., 2021	*N* = 44 82.5% F 46.22/2	US-guided injection of dextrose	US-guided injection of corticosteroid	NRS FAAM US parameter	0.5, 03	1/NA	The corticosteroid injection may reduce pain and abnormal thickness of the plantar fascia better early after treatment (up to 2 weeks), but both corticosteroid and dextrose prolotherapy have similar continuous effects for a few months (up to 12 weeks).
Asheghan et al., 2020	*N* = 59 66.1% F 45 ± 7/2	Dextrose	ESWT	VAS FAAM	1.3, 03	2 and 3/2 and 3	Dextrose prolotherapy has comparable efficacy to ESWT in improving pain, functional outcomes, and ultrasonographic features in these patients.
Mansiz-Kaplan et al., 2020	*N* = 60 75% F 46 ± 9/6	Dextrose injection	Placebo	VAS FFI	01, 03	2/3	Dextrose prolotherapy was effective in the treatment of PF for up to 15 weeks dextrose injection is also reproducible, inexpensive
Moshrif et al., 2019	N = 122 73.7% F 42 ± 9/3	Steroid injection + dextrose injection (D5W)	Steroid injection	VAS	NR	1/NA	The addition of 0.5 ml. D5W can significantly decrease the pain associated with local steroid injection for the treatment of plantar fasciitis.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Kim et al., 2014	*N* = 21 47.6% F 37 ± 10/6	Dextrose prolotherapy	PRP	FFI-p	0.5, 2.5, 6.5	2/2	Each treatment seems to be effective for chronic recalcitrant PF, expanding the treatment options for patients in whom conservative care has failed. PRP treatment also may lead to a better initial improvement in function compared with DP treatment.
Raeissadat et al., 2020	*N* = 75 53.4% F 41.03 ± 8.9/3	US-guided HA injection	US-guided CS injection	VAS FAAM PPT FFI	1.5, 06	01/NA	Both CS and HA were effective modalities for PF and can improve pain and function with no superiority in 24th-week follow-ups, although CS seems to have a faster trend of improvement in the short term.
Kumai et al., 2018	*N* = 166 66.8% F 52 ± 15/3	Group 1: High-molecular-weight HA (high dose) injection	Group 2: Low-HA dose injection Group 3: Control (very low dose) injection	VAS RMS	1.25	5/5	Injection of high-molecular-weight HA is an effective treatment for plantar fasciopathy without any serious adverse drug reactions.
Mulherin et al., 2009	*N* = 45 60% F 55 ± 10/ NR	Group 1: Steroid injection	Group 2: Local anesthetic block to the tibial nerve Group 3: Local anesthetic block to the tibial nerve + steroid	VAS HTI	0.25, 1.5, 6.5	1/NA	This study suggests that the natural history of PHPS following an injection is encouraging, that a tibial nerve block reduces the discomfort of the procedure, that a steroid injection to the heel may accelerate improvement and that clinicians should consider a combination of both strategies.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Lee et al., 2019	*N* = 38 76.3% F 53 ± 12/3	PDRN injection	Steroid injection	VAS MOXFQ US	0.25, 0.5, 1.5, 06	1/NA	PDRN therapy can be an effective and safe option in the treatment of plantar fasciitis and was comparable to CS injection after 6 months of follow up.
Kim et al., 2015	*N* = 36 72.5% F 53.5 ± 10/6	PDRN injection	Placebo	VAS MOXFQ	01, 03	3/3	PDRN injection is an efficient and safe therapeutic option for the treatment of chronic plantar fasciitis.
Ahmadzadeh Heshmati, 2019	*N* = 74 77% F 43 ± 5 / NR	Steroid injection (40 mg)	Steroid injection (20 mg)	VAS AOFAS	0.75, 1.5	1/NA	A 20 mg injection of methylprednisolone acetate is sufficient for the improvement of symptoms in patients and adding more doses of the steroid has a no more beneficial effect.
Li et al., 2014	*N* = 54 68.5% F 55 ± 9/ NR	Steroid injection	Miniscalpel-needle	VAS	01, 06, 12	1/NA	Patients who received MSN release treatment reported more favorable and more sustained improvements in pain compared to those who received steroid injections at 1-, 6- and 12-month follow-ups.
Chen et al., 2013	*N* = 32 59.3% F 54 ± 10/2	Steroid injection	Steroid injection device-assisted (US-guided)	VAS SF-36 US	0.75, 03	1/NA	Patients treated with device-assisted ultrasound-guided steroid injection tolerated much higher direct pressure on the plantar fascia and exhibited reduced subjective heel pain and no heel pad atrophy at 3 months.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Abdihakin et al., 2012	*N* = 88 52% F 42 ± 9/ NR	Steroids	Control (placebo)	VAS FFI	01, 02	1/NA	One and two months after steroid injection for the treatment of plantar fasciitis, we detected no difference with respect to pain or function when compared with a control arm of conservative treatment alone. One and two months after steroid injection for the treatment of plantar fasciitis, we detected no difference with respect to pain or function when compared with a control arm of conservative treatment alone.
McMillan et al., 2012	*N* = 82 47.6% F 52 ± 10/ NR	US-guided steroid injection	US-guided placebo injection	FHSQ	01, 02, 03	1/NA	A single ultrasound-guided dexamethasone injection is a safe and effective short-term treatment for plantar fasciitis, providing better pain relief than a placebo at four weeks. Significant pain relief did not continue beyond four weeks.
Ball et al., 2012	*N* = 65 55.3% F 49 ± 11/ NR	Group 1: Steroid injection	Group 2: Steroid injection US-guided Group 3: Placebo injection US-guided	VAS HTI	1.5, 03	1/NA	Steroid injection showed a clear benefit over placebo at 6 weeks and this difference was maintained at 12 weeks.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Yucel et al., 2009	*N* = 27 79.2% F 46 ± 11/ NR	Group 1: Steroid injection	Group 2: Ultrasonography-guided steroid injections Group 3: Scintigraphy-guided steroid injections	VAS US	25.3	1/NA	All three methods were effective in the treatment of plantar fasciitis, and there was no statistically significant divergence between these techniques in terms of plantar fascia thickness, fat pad thickness, and VAS value.
Guner et al., 2013	*N* = 61 77% F 41 ± 12/ 12	Tenoxicam injection	Steroid injection	VAS	06, 12	1/NA	Tenoxicam injection was not significantly more effective than the CS injection for the treatment of plantar fasciitis; rather, both methods were effective and successful in treating the condition.
Bahar-Ozdemir et al., 2021	*N* = 45 77.27% F 51.57 ± 9.27<6	Group 1: ESWT and low-dye KT	Group 2: ESWT and sham-taping Group 3: ESWT	VAS HTI FFI	01	5/5	Although low-dye KT in addition to ESWT was more effective on foot function improvement than additive sham-taping and ESWT alone, it did not provide a significant benefit on pain and heel tenderness because of PF.
Pinrattana et al., 2021	*N* = 30 0% F 23.32 ± 2.83/1.5	Group1: KT + stretching exercise	Group 2: KT Group 3: Stretching exercise	VAS MFPDI	0.25	01. KT 03. Stretching per day/1	Improvement in heel pain was observed in all groups after the first treatment. However, improvement in foot function over one week was observed only among those who received the combined treatment.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Sankhe et al., 2016	*N* = 52 48% F 42 ± 9/ NR	LDT	Calcaneal taping	VAS FFI	0.25	7/1	The study led to the conclusion that low dye taping is significantly more effective than calcaneal taping in reducing pain and increasing the foot function in patients with plantar fasciitis.
Park et al., 2015	N = 30 NR% F 35 ± 4/ NR	LDT + conventional	Conventional	VAS TAOCOG	1.5	18/6	Applying modified LD taping is more effective for reducing foot pain, correcting weight distribution, and improving stability due to foot correction than performing conservative physiotherapy only.
Abd El Salam et al., 2011	*N* = 30 23.3% F 52 ± 4/1	LDT	Medial arch support orthosis	VAS FPDS	0.75	9/3	Medial arch support is more convenient than the low-Dye taping technique in the short-term management of pain and pain-related disability in plantar fasciitis.
Van Lunen et al., 2011	*N* = 17 70.5% F 35 ± 15/ NR	Group 1: ALD taping—LDT	Group 2: HPO-orthosis Group 3: Control	VAS Pressure	After walking and jogging	1/NA	Both interventions (HPO and ALD) showed an improvement in pain levels (between 1 and 1.65 point change), and pressure changes vary when applying either the ALD or HPO for individuals with plantar fasciitis.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Tsai et al., 2010	*N* = 52 63.4% F 41 ± 20/ 10	Kinesio (tape)	Control	McGill (VAS) FFI	0.25	1/1	Treatment with KT continuously for one week can provide pain relief in patients with plantar fasciitis with a better effect as compared to those treated with only physical therapy. The changes in the plantar fascia thickness at the most inflamed site and the inflammation changes (hypoechoic) may not be affected after KT.
Landorf et al., 2005	*N* = 105 66.6% F 46 ± 11/1	LDT	Control	VAS	Initial 3–5 days (0.5–0.75 months)	1/3 to 5 days	Low-dye taping as a short-term treatment may be highly effective in reducing the painful symptoms of plantar fasciitis.
Tkocz et al., 2021	*N* = 60 60% F 60.15/6	HILT	Sham high-intensity laser therapy (Sham-HILT)	VAS LPS	01, 03	15/3	The HILT used in this research project does not appear to be effective in treating pain symptoms in patients with heel spurs and plantar fasciitis compared to the conservative standard physiotherapeutic approach.
Naruseviciute et al., 2020	*N* = 102 79.4% F 56 ± 10/1	LLLT	HILT	VAS pressure NRS US	0.75, 1.75	8/3	Both groups improved, but there was no statistically significant difference between HILT and LLLT observed. Most of the participants considered treatment to be effective.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Takla et al., 2019	*N* = 120 42.5% F 54 ± 9/6	Group 1: PBMT (LLLT)	Group 2: ESWT + PBMT Group 3: ESWT Group 4: Sham-PBMT	VAS PPT FFI	0.75, 03	9/3	Application of PBMT after ESWT was shown to be superior over ESWT and PBMT alone, and ESWT was superior over PBMT in terms of reducing pain sensitivity and increasing function.
Yinilmez Sanmak et al., 2019	*N* = 34 85.3% F 51 ± 10/ NR	LLLT	ESWT	VAS FFI US	0.75, 01	3/3	Both ESWT and LLLT are effective treatments for PF in the short term and are not superior to each other.
Cinar et al., 2018a	*N* = 66 15.5% F 45 ± 9/1	Group 1: ESWT	Group 2: LLLT Group 3: Control (conventional)	FFI-p NRS-p	0.75, 03	3 and 10/3	When LLLT and ESWT were combined with usual care, LLLT was found to be more effective than ESWT in reducing pain in PF at short-term follow-up.
Cinar et al., 2018b	*N* = 49 82% F 45 ± 9/1	LLLT	Control	VAS, AOFAS	0.75, 03	10/3	The combination therapy of LLLT with usual care is more effective to improve functional outcomes and activity-related pain when compared to usual care alone.
Ordahan et al., 2018	*N* = 70 78.5% F 48 ± 11/ 1.5	LLLT	HILT	VAS FAOS	0.75	9/3	Three weeks later, both groups showed significant improvement in all parameters ($p<0.05$). The HILT group demonstrated better improvement in all parameters than the LLLT group.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Ulusoy et al., 2017	*N* = 54 81.6% F 52 ± 10/3	Group 1: LLLT	Group 2: US Group 3: ESWT	VAS AOFAS	01	15/3	LLLT and ESWT were more successful in providing pain improvement and functional outcomes compared with US therapy at 1 month after treatment.
Xiao et al., 2016	*N* = 66 42.4% F 42 ± 13/ 1.5	LLLT	LLLT + US	VAS	02	30/NR	The low-intensity focused ultrasound combined with a semi-conductor laser for plantar fasciitis is a reliable method, which is worthy to be popularized.
Macias et al., 2015	*N* = 69 61% F 56 ± 12/1	LLLT	Placebo	VAS FFI	0.25, 0.5, 0.75, 1.5, 02	6/3	The authors were able to demonstrate a statistically significant reduction in pain for patients undergoing laser therapy compared with those who received placebo treatment.
Suleymanoglu et al., 2014	*N* = 90 91.1% F 48 ± 8/ NR	LLLT	RSWT	VAS FFI	01, 03	12/4	RSWT is effective in reducing pain and both the RSWT and LLLT can be effective in reducing the plantar thickness in patients with chronic plantar fasciitis, especially three months after treatment.
Lu et al., 2011	*N* = 83 NR% F NR/NR	Semiconductor laser beam + ultrashort waves (LLLT + UW)	Ultrashort waves	VAS NRS	NR	NR/NR	This research concludes that semi-conductor laser treatment can increase the treatment efficiency considerably.
Kiritsi et al., 2010	*N* = 25 40% F 41 ± 12/ 1.5	LLLT	Placebo	VAS	1.5	18/6	904 nm GaAs IR laser therapy may contribute to plantar fasciitis healing and pain reduction.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Basford et al., 1998	*N* = 31 77.4% F 42 ± 10/ NR	LLLT	Placebo	VAS	01	12/4	We did not find .831am continuous-wave IR laser radiation effective in the treatment of plantar fasciitis. It is possible that higher treatment intensities/energies or a different waveform might be effective, but we do not know.
Alotaibi et al., 2020	*N* = 44 65.9% F 49 ± 10/ NR	NMES-MPC	MPC + stretching (SE)	VAS FAAM US	01	12/4	MPC combined with plantar fascia SE is not superior to MPC only to decrease the heel pain and the plantar fascia thickness. Although, both MPC and MPC combined with plantar fascia SE showed significant decreases in heel pain and plantar fascia thickness caused by PF.
Fernández-Rodriguez et al., 2018	*N* = 73 63% F 45 ± 11 / 3	PNE (electrolysis)	Placebo	NPRS FAAM	1.5, 4.25, 25.25	10/5	With chronic plantar heel pain, ultrasound-guided percutaneous needle electrolysis improved pain and function.
Razzano et al., 2017	*N* = 104 49% F 51 ± 11/6	NMES-NIN	ESWT	VAS FFI	01, 03	10/3	The present prospective randomized controlled study showed superior results with NIN compared with ESWT, in terms of the functional score, pain improvement, and daily intake of NSAIDs.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Alotaibi et al., 2015	*N* = 44 65.9% F 49 ± 10/ NR	NMES-MPC	MPC + stretching	VAS FAAM	01	12/4	This prospective controlled trial supports the efficiency of MPC in reducing inferior heel pain and tenderness and improving functional activity levels associated with PF.
Stratton et al., 2009	*N* = 26 NR% F 41 ± 10/ <6	NMES-low-frequency electrical stimulation + stretching and orthosis	Stretching and orthosis	VAS FAAM	01, 03	30/4	Regardless of whether low-frequency electrical stimulation was used in the treatment program, plantar fascia stretching and prefabricated basic foot orthoses provided short-term pain relief (up to 3 months) and improvements in functional activity levels (up to 1 month) for all of the participants in this study.
Donley et al, 2007	N = 29 72.4% F 48 ± 10 / NR	NSAID	Placebo	FFI	01,02,06	30 / 4	These results provide some evidence that the use of an NSAID may increase pain relief and decrease disability in patients with plantar fasciitis when used with a conservative treatment regimen.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Lynch et al, 1998	N = 85 NR% F 49 ± 17 / NR	Group 1: NSAID + steroid injection	Group 2: Accommodative (Heel Cup); Group 3: Mechanical (taping and orthoses)	VAS	0.5,01,1.5,03	30 days NSAID + 2 or 3 injections of steroids / 12	Mechanical control of the foot with taping and orthoses is more effective than either anti-inflammatory therapy with NSAIDs in combination with injections or accommodative therapy with heel cups in the conservative treatment of plantar fasciitis.
Rasenberg et al, 2021	N = 185 69.2% 47.6 ± 10.6 / 0.5 to 24	Group 1: GP-led and an information booklet with exercises (usual care)	Group 2: podiatrist and a custom-insole and a booklet Group 3: podiatrist and a sham-insole and a booklet	NRS FFI	03, 06	NR / NR	Referral to a podiatrist for a custom-made insole does not lead to a better outcome compared to sham insoles or compared to GP-led usual care.
Coheña-Jiménez et al., 2021	*N* = 76 54% F 36.5 ± 2.46/6	Custom-made foot orthoses and ESWT and stretching	Placebo insoles and ESWT and stretching	VAS RMS	01, 06	Daily use (08 hours per day) 03-ESWT/ Orthosis-24 ESWT-NR	The custom-made foot orthoses combined with a program of stretches and extracorporeal shock wave therapy significantly reduced foot pain and functionality. A combination of treatments is more effective than one on its own.
Seligman et al., 2021	*N* = 44 72.7% F 60.81 ± 15.2/NR	Soft orthotic	Hard orthotic	BPI-VAS Late-life FDI	1.5	Daily use/6	Both soft and hard orthotics provided effective pain relief, however, soft orthotics are less expensive.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Shim et al., 2021	*N* = 28 71.4% F 48.2 ± 9.4/1.5	TSI	TCI	VAS AOFAS FAOS KP SF-36 FFI	1.5, 03, 06	Daily use/24	We reaffirmed that a semi-rigid insole is effective in plantar fasciitis and showed a non-inferiority of TSI based on VAS. In addition, TSI more rapidly restored the pedal function compared to TCI.
Xu et al., 2019	*N* = 60 50% F 41 ± 5/5	Orthosis-customized 3D-printed AFO	Prefabricated AFO	VAS plantar pressure comfort	02	NR/8	This study supports the efficiency of customized 3D printing AFO for reducing damage associated with plantar lesions and improving comfort in patients with plantar fasciitis compared with prefabricated AFO.
Costa et al., 2019	*N* = 66 93.9% F 47 ± 9/3	Orthosis-custom insole sandal	Plain sandal	VAS NRS FAAM FFI 6MWT	03	4 h per day/12	Patients with plantar fasciopathy treated with flip-flop sandals with insoles based on plantigraphy for 12 weeks had higher treatment satisfaction when compared to patients treated with flat sandals.
Bishop et al., 2018	*N* = 60 48.3% F 44 ± 13/1	Group 1: Orthosis and new shoe	Group 2: Sham-orthosis and new shoe Group 3: Sham-orthosis and regular shoe	VAS	01, 03	NR/12	Compared to wearing new shoes alone or a sham treatment, using custom foot orthoses resulted in less first-step pain and a less thickened plantar fascia. Custom foot orthoses were no more effective than wearing new shoes in the reduction of average 24-h pain.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Wrobel et al., 2015	*N* = 17 63.3% F 49 ± 12/ <12	Group 1: Prefabricated foot orthosis	Group 2: Customized foot orthosis Group 3: Sham orthosis	FFI-R SF-36	01, 03	NR/12	All of the groups improved in morning pain after 3 months of treatment that also included standardized athletic shoes, stretching, and ice.
Fong et al., 2012	*N* = 15 80% F 50 ± 5/ NR	Custom-made foot orthosis	Baseline shoes; RS shoes; RS shoes + custom-made foot orthosis	VAS	NA	Walking trials/NA	A combined prescription of rocker sole shoes and custom-made foot orthoses had greater immediate therapeutic effects compared to when each treatment had been individually prescribed.
Baldassin et al., 2009	*N* = 125 75% F 47 ± 12/ NR	Prefabricated foot orthosis	Customized foot orthosis	FFI	01, 02	NA/8	The low-cost prefabricated and customized foot orthoses, as used in this trial, had similar effectiveness in the treatment of noncomplicated plantar fasciitis after 8 weeks of use.
Landorf et al., 2006	*N* = 136 66% F 48 ± 11/1	Group 1: Sham orthosis Group 2: Prefabricated foot orthosis	Group 3: Customized foot orthosis	FFI	03, 12	NA/12	Commonly prescribed customized and prefabricated orthoses produce small short-term benefits for people with plantar fasciitis compared with a sham device. Long-term effects on pain and function are negligible. The effects of prefabricated and customized orthoses are similar.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Kavros et al., 2005	*N* = 50 82% F 25 to 63/ <2	Air-heel	Prefabricated foot orthosis	FFI	03	NA/4	The addition of a prefabricated insert such as the air cast air heel has been shown to be effective in the management of plantar fasciitis.
Martin et al., 2001	*N* = 255 76.4% F 47 ± 11/ NR	Orthosis-arch supporting insole	Custom-made foot orthoses, TNS	VAS	0.5, 1.5, 03	NR/12	Custom-made orthoses, over-the-counter arch supports, and tension night splints are all effective as initial treatments for plantar fasciitis. Patients in the present study demonstrated the best compliance with the use of custom-made orthoses.
Pfeffer et al., 1999	*N* = 236 67.8% F 47 ± 16/6	Group 1: Custom customized foot orthosis	Groups 2, 3, 4: prefabricated foot orthosis (silicone, rubber, felt) Group 5: Stretching	FFI-p	02	NA/8	The use of relatively inexpensive prefabricated inserts, along with Achilles tendon and plantar fascia stretching, is more effective than a custom polypropylene orthosis for the initial treatment of proximal plantar fasciitis.
Ryan et al., 2009	*N* = 21 NR% F 40 ± 7/6	Flexible shoe	Conventional shoe	VAS	03, 06	NA/12	There were no significant differences in pain levels at follow-up between groups.
Winemiller et al., 2003	*N* = 101 79.2% F 41 ± 9/1	Orthosis-magnetic insole	Sham-magnetic insole	VAS	01, 02	Daily/8	Static bipolar magnets embedded in cushioned shoe insoles do not provide additional benefits for subjective plantar heel pain reduction when compared with nonmagnetic insoles.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Caselli et al., 1997	*N* = 40 64.7% F 43 ± 8/ NR	Orthosis-magnetic insole	Sham-magnetic insole	FFI	01	NA/4	These results suggest that the PPT/Rx firm molded insole was effective in treating heel pain after only 4 weeks. The magnetic foil offered no advantage over the insole.
Whittaker et al., 2019	*N* = 103 61.1% F 43 ± 11/1	Prefabricated foot orthosis	Steroid	VAS FHSQ EQ-5D SF-36	01, 03	Participants were asked about the use/4 and 12 weeks	Corticosteroid injection is more effective than foot orthoses at reducing pain in the short term; however, foot orthoses are more effective at reducing pain in the longer term.
Malkoc et al., 2015	*N* = 75 69% F 47 ± 11/ NR	Orthosis-prefabricated medial arch supporting insoles	Heel pads	VAS FAAM	08–14	NR/NR	There was no difference in the clinical results of conservative treatment modalities of plantar fasciitis with heel pads and medial arc-supported insoles.
Oliveira et al., 2015	*N* = 74 89.1% F 50 ± 10/ NR	Orthosis-TCI	Flat insole	VAS FFI FHSQ	1.5, 03, 06	Daily/24	A TCI can be used to diminish pain while walking and achieve a greater walking distance in patients with PF.
Yucel et al., 2013	*N* = 40 80% F 46 ± 8/3	Steroid injection	Orthosis	VAS FAOS HTI	01	1/NA	When the groups were compared after treatment, VAS scores, FAOS pain, FAOS activities of daily living, FAOS sport and recreation function, and plantar fascia thickness were better in the injection group than in the insole group.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Walther et al., 2013	*N* = 30 70% F 53 ± 13/ NR	Group 1: Orthosis-non-supportive insole	Group 2: Soft supportive insole Group 3: Rigid supportive insole	VAS	03	NR/3	There is a level of superiority in multilayered, three-dimensional arch supports over pure foot cushioning, both in terms of pain reduction and in terms of a faster onset of action.
Rome et al., 2004	*N* = 48 60% F 59 ± 13 / 2	Accommodative orthosis	Functional orthosis	FHSQ	01, 02	NA/8	The present study demonstrates a significant difference after using the functional orthosis for 8 weeks in foot pain and foot function (FHSQ) and overall health status (EQ5D).
Babaei-Ghazani et al., 2019	*N* = 30 90% F 46 ± 9/2	Steroid injection	Ozone injection	VAS FAAM US	0.5, 03	1/NA	In a short time, we observed better improvement with CS injection, and in long term (12 weeks follow-up), the improvement was more significant with ozone (O_2–O_3) injection.
Bahrami et al., 2019	*N* = 44 65.9% F 47 ± 9/3	Steroid injection	Ozone injection	VAS FAAM PPT	0.25, 01, 03	1/NA	Our results proved that both groups significantly improved regarding their pain and level of function and PPT.
Chew et al., 2013	*N* = 54 46.3% F 46 ± 4/4	Group 1: ACP injection	Group 2: ESWT Group 3: Conventional	VAS AOFAS US	01, 03, 06	1/NA	Treatment of plantar fasciitis with either ACP or ESWT resulted in modestly improved pain and functional score improvements compared with conventional treatments alone over a 6-month follow-up period.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Wheeler et al., 2022	*N* = 90 67%F 49.5 ± 8.9/3	ABI and DN	DN	FFI MOFQ FAAM EuroQoL	0.5, 1.5, 03, 6.5	1/NA	Activity rates did not change, demonstrating that improvements in pain did not necessarily influence physical activity. Co-administration of 3 ml of autologous blood had no additional effect compared to a dry-needling procedure alone for patients with chronic plantar fasciitis.
Karimzadeh et al., 2017	*N* = 36 63.8% F 47 ± 10/2	Group 1: Steroid injection	Group 2: Autologous blood Group 3: Control	VAS PFPS	01, 03	1/NA	The effect of local autologous whole blood injection in chronic PF was superior to conservative treatment and comparable to CS injection.
Afsar et al., 2015	*N* = 130 56.9% F 31 ± 11/3	Steroids	Autologous blood	VAS	1.5,03,06	1/NA	Autologous blood injection and CS injection has shown compatible short-term result and both can be used as effective treatment modalities although a long-term comparative study is recommended to confirm our results.
Yesiltas et al., 2015	*N* = 49 57.1% F 45 ± 9/ NR	AVBI (blood)	Steroid	VAS	1.5, 03, 06	1/NA	AVBI and ISI administrations provide a decrease in patient pain severity. At the end of the 6th week, ISI administration caused decreasing in both THP thickness and inflammation severity while AVBI administration did not cause similar situations.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Kalaci et al., 2009	*N* = 100 70% F 51 ± 9/ NR	Group 1: Steroid injection	Group 2: Autologous blood Group 3: Local anesthetic injection + peppering Group 4: Steroid + peppering	VAS RMS	0.75, 06	1/NA	Corticosteroid injection with peppering can be used as the first alternative in plantar fasciitis in cases in which other conservative methods failed. Autologous blood or lidocaine with peppering may be alternative treatments, but these techniques may require multiple injections.
Lee et al., 2007	*N* = 61 93.4% F 48 ± 11/ 1.5	Steroid injection	Autologous blood injection	VAS TT	1.5, 03, 06	1/NA	Intralesional autologous blood injection was efficacious in lowering pain and tenderness in patients with chronic plantar fasciitis. However, CS was superior in terms of speed and probably the extent of improvement.
Kiter et al., 2006	*N* = 44 71.1% F 50 ± 12/6	Group 1: Peppering	Group 2: Autologous blood Group 3: Steroids	VAS AOFAS	06	3, 3, and 2 sessions/12	The peppering technique and autologous blood injection seem to be good alternatives to CS injection for the treatment of plantar heel pain, although the mechanism of cure is not completely understood.
Bildik et al., 2022	*N* = 60 65% F 52.4 ± 6.4/1.5	PRP	ABI	HRQoL FADI VAS	NR	1/NA	Participants with plantar fasciitis improved statistically significantly after either PRP or ABI injections compared with baseline HRQoL scores, with no significant differences seen between the groups.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Haddad et al., 2021	*N* = 104 63.46% F 44.4 ± 5<18	PRP	ESWT	VAS	0.5, 01, 02, 03, 04, 06	01-PRP 03-ESWT/ ESWT-3	In the current study, we indicated that the pain of the patients reduced significantly following both PRP and ESWT treatments. We also showed that pain reduction was more among patients treated with PRP compared to the ESWT method.
Khurana et al., 2020	*N* = 118 44.9% F 33.63 ± 5.22/1	PRP	Steroid injection	VAS	0.5, 01, 03, 06	1/NA	Despite some shortcomings, the current RCT suggests that plantar fasciitis patients benefit from both PRP and steroid therapy. However, the benefit is more with PRP in terms of mid-term control of pain as well as functional improvement.
Breton et al., 2021	*N* = 42 69% F 50.5 ± 11.5/3	US-guided PRP injection	US-guide CS—CS injection	VAS FFI PF thickness	01, 03, 06	1/NA	PRP injections are effective in approximately two-thirds of patients with PF regardless of fascial thickness. However, with CS injections, a marked initial aponeurotic thickness was closely associated with a favorable clinical response at six months.
Tabrizi et al., 2020	*N* = 32 90.6% F 32 ± 8/ NR	PRP	Steroid injection	VAS	02, 03, 06	3/3	In obese patients with plantar fasciitis, injection with CS was more effective than PRP at reducing pain and improving function.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Malahias et al., 2019	*N* = 36 NR% F NR/6	PRP	PPP	VAS VAS-F VAS-S	03, 06	1/NA	A single US-guided PRP injection yields similar results with PPP injection in patients with chronic plantar fasciitis. Both treatments provide significant improvement at the 6-month follow-up after the injection.
Johnson-Lynn et al., 2019	*N* = 28 67.8% F 50 ± 10/6	PRP	Placebo	VAS	6.5, 13	1/NA	This pilot study has not produced evidence of significant benefit for the use of PRP, over normal saline, in the treatment of plantar fasciitis.
Shetty et al., 2019	*N* = 90 54.4% F 44 ± 6/ NR	Group 1: PRP	Group 2: Steroid injection Group 3: Placebo	VAS	0.25, 0.75, 03, 06, 12, 18	1/NA	Steroids appeared better in the short term; however, results were less superior than PRP in the long term.
Gonnade et al., 2018	*N* = 54 63% F 46 ± 8/3	US-guided PRP	US + KT	NRS FFI US	0.5, 1.5, 03, 06	2 and 10 sessions/ 4	Autologous PRP injection of high platelet counts is more efficacious as compared to Phonophoresis with KT which gives temporary benefit in PF. The effects of PRP are long-lasting and no adverse effects were reported.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Uğurlar et al., 2018	*N* = 158 50% F 38 ± 10/ 12	PRP	ESWT, prolotherapy, steroid	VAS FFI	01, 03, 06, 12, 24, 36	3/3	Steroid injection will be more effective in the first 3 months, and ESWT is a safe, effective method in the first 6 months with regard to pain. The effect of prolotherapy and PRP will be seen within 3 to 12 months; however, at the 36-month follow-up point, we found no differences among the 4 treatments.
Acosta-Olivo et al., 2017	*N* = 28 90% F 44 ± 10/ NR	Steroid injection	PRP	VAS AOFAS FADI	0.5, 01, 02, 03, 04	1/NA	The use of PRP is an effective treatment method for patients with plantar fasciitis who do not respond to conservative treatment because PRP demonstrates an efficacy equal to that of steroids.
Gogna et al., 2016	*N* = 40 35% F 27 ± NR/ 6	PRP	LDR	VAS AOFAS	03, 06	1/NA	Both PRP and LDR hasten the process of healing plantar fasciitis. Moreover, we did not encounter any complications in any of our procedures.
Mahindra et al., 2016	*N* = 75 58.6% F 33 ± 8/ NR	Group 1: Steroid injection	Group 2: PRP Group 3: Placebo	VAS AOFAS	0.75, 03	1/NA	Local injection of platelet-rich plasma or CS is an effective treatment option for chronic plantar fasciitis.
Sherpy et al., 2016	*N* = 50 95% F 38 ± 7/3	PRP	Steroid	VAS FHSQ	1.5, 03	1/NA	The efficacy of PRP injections in treating PF was found to be comparable to steroid injections in short-term follow up with earlier initiation of healing.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Vahdatpour et al., 2016a	*N* = 34 73.5% F 46 ± 9/3	PRP	Whole blood (WB)	NPRS RMS	01, 03	1/NA	The study results indicate the similar effectiveness of an intralesional injection of PRP and WB for the treatment of chronic PF in the short term.
Vahdatpour et al., 2016b	*N* = 32 71.8% F 46.2 ± 9/3	PRP	Steroid	VAS, RMS	01, 03, 06	1/NA	Administration of PRP leads to significant improvement in pain severity and physical limitation in patients with plantar fasciitis. This healing effect may be begun at least 3 months after injection.
Jain et al., 2015	*N* = 46 65.2% F 55 ± 13/12	PRP	Steroid	VAS AOFAS RMS	03, 06, 12	1/NA	PRP is as effective as steroid injection at achieving symptom relief at 3 and 6 months after injection, for the treatment of plantar fasciitis, but unlike steroids, its effect does not wear off with time. At 12 months, PRP is significantly more effective than steroids, making it better and more durable than cortisone injection.
Tiwari et al., 2013	*N* = 60 NR% F 30 to 85/NR	PRP	Steroid	VAS	01, 03, 06	1/NA	The results at the 1, 3, and 6 months were evaluated, which showed good results with platelet-rich plasma in comparison to steroid injections.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Omar et al., 2012	*N* = 30 100% F 43 ± 16/ NR	PRP	Steroid	VAS FHSQ	1.5	1/NA	Local injection of autologous PRP proved to be a promising form of therapy for PF. It is both safe and effective in relieving pain and improving function and is superior to local steroids in PF.
Yildiz et al., 2022	*N* = 39 66.6% F 40.38 ± 12.7/NR	Group 1: IPG	Group 2: HBEG Group 3: IG	VAS DROM AOFAS 6 MWT WHOQOL-BREF	1.5	12/6	All interventions were determined to have been helpful to reduce pain and increase clinical foot status, and function clinically over the 6 weeks in patients with plantar fasciitis with high patient adherence in this pilot study. Custom-made orthotic insoles could be applied alone or with other techniques, such as stretching and strengthening exercises. Moreover, manual techniques could be the preferred choice for patients with limited ankle dorsiflexion over the short term.
Kaiser et al., 2022	*N* = 57 NR%F NR/NR	Physical therapy (PT)	Home-based fascia stretching (HS)	VAS FAAM SF-36	1.5, 03, 06, 12	NR/NR	Component summary scores demonstrated improvement at all-time points in both groups. The clinical outcomes of a home stretching protocol and PT did not markedly differ for the treatment of PF.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Chesterton et al., 2021	*N* = 82 66% F 55/1	Group 1: SMA and exercises	Group 2: SMA and prefabricated orthoses Group 3: SMA and exercises and prefabricated orthoses Group 4: SMA	NRS FFI-pain MFPFI-pain	03	06-exercises per day Orthosis: daily use (4 hours per day) / 12	Satisfaction with treatment was higher for the three clinician-supported interventions (SMA 29%, SMA-exercises 72%, SMA-orthoses 71%, SMA-combined 73%). We demonstrated the feasibility of conducting a future main randomized clinical trial comparing the clinical and cost-effectiveness of SMA, exercises, and/or foot orthoses for PHP.
Kashif et al., 2021	*N* = 52 48.07% F 32,5 ± 7.5 / NR	Subtalar mobilization	Therapeutic ultrasound.	VAS FADI	0.25, 0.5, 0.75	6/3	Individuals with PF who received subtalar mobilization with movement, stretching exercise plus rigid taping showed significantly greater improvement in pain and functional disability than the conventional physiotherapy group which received an ultrasound, stretching exercise, and rigid taping.
Ranbhor et al., 2020	*N* = 50 28% F 35.68 ± 12.25 / NR	Stretching	Foam roller	VAS PPT WBLT	NR	1/NA	Both stretching and foam rolling techniques helped in reducing pain and increasing the ROM. However, the effectiveness of foam rolling was superior to stretching in terms of an increase in the PPTs at the gastrocnemius and soleus.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Gupta et al., 2020	*N* = 140 75% F 43.64 ± 10.6 / 1.5	Group 1: Analgesics	Group 2: Heat and heel pads Group 3: PF stretching Group 4: Calf stretching	FFI FADI	04, 06, 08,12	Daily-all groups/ group 1–3 (max) Others—3	Plantar fascia stretching exercises resulted in the most significant improvement in both the scores (FFI and FADI), followed by treatment with heat and silicone heel pad and calf stretching exercises.
Dimou et al., 2004	*N* = 20 35% F 42 ± 9/ 1.75	Chiropractic manipulation	Custom functional foot orthosis	NPRS FSPS Algometry	0.5, 01, 3.25	NA/9	Within the limits of this trial, both treatments appeared useful when used individually for the treatment of common plantar fasciitis and further research is supported.
Saban et al., 2014	*N* = 69 56.5% F 53 ± 12/ NR	Exercise + deep massage (Gastroc)	Exercise + US	VAS FS	1 to 1.5	8/4 to 6	Deep massage therapy to posterior calf muscles and neural mobilization combined with stretching exercises had superior short-term FS outcomes compared to ultrasound treatment with stretching exercises.
Kamonseki et al., 2016	*N* = 83 79.5% F 45 ± 11/1	Group 1: Exercise (foot and hip)	Group 2: Exercise (foot) Group 3: Stretching	VAS FAOS	02	224/8	All three exercise protocols analyzed led to improvements at the eighth-week follow-up in pain, function, and dynamic lower limb stability in patients with plantar fasciitis.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Rathleff et al., 2015	*N* = 48 66% F 46 ± 7/3	Hi-load strength training	Stretching	FFI	01, 03, 06, 12	NR/12	A simple progressive exercise protocol consisting of high-load strength training, performed every second day, resulted in a superior outcome at 3 months compared with plantar-specific stretching and may aid in a quicker reduction in pain and improvements in function.
Çil, 2019	*N* = 47 74.4% F 48 ± 11/ 1.5	Exercise + manual therapy (outpatient)	Exercise (home)	VAS FFI ROM	02, 06	16/8	The combined nonoperative management involving patient education; foot, ankle, and hip stretching and strengthening exercises; "hands-on" myofascial releasing; and joint and soft tissue mobilization was more effective than foot and ankle-only stretching and strengthening exercises.
Celik et al., 2016	*N* = 39 71.8% F 45 ± 8/ NR	Exercise	Steroid injection	VAS FAAM	0.75, 1.5, 03, 12	1/NA	Patients with PF exhibit short-term relief with SI followed by an increase in symptoms that equal the final results produced by manual therapy.
Shashua et al., 2015	*N* = 50 70% F 51 ± 12/ NR	Joint mobilization + conventional (US therapy and stretching)	Conventional (US therapy and stretching)	NPRS LEFS Algometry	0.5, 01, 2.5	8/4	The addition of ankle and foot joint mobilization aimed at improving dorsiflexion range of motion is not more effective than stretching and ultrasound alone in treating PF.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Ryan et al., 2014	*N* = 56 57.1% F 49 ± 8*/ 12	Exercise	Steroids	VAS FADI	03	90/12	The present study found no change in fascial thickness but substantial changes to the prevalence and size of anechoic regions at 12-week follow-up owing possibly to a different injectate (dexamethasone) and different sample demographics and tissue response after prolonged standing.
Grecco et al., 2013	*N* = 40 85% F 49 ± 1/3	Exercise (PT)	ESWT	VAS, algometer	1.25, 03, 12	10/5	The two treatments evaluated here were effective for maintaining the improvements in pain and functional ability among the patients with plantar fasciitis until the follow-up 12 months after the treatment.
Al-Bluwi et al., 2011	*N* = 197 NR% F 43 ± 3/ NR	Group 1: Orthosis (EZStep) + NSAID	Group 2A: PT + NSAID Group 2B: PT + steroid + NSAID	VAS SFMPQ	06	NR/4 to 6	Combined treatment with short duration (4-6 weeks) NSAIDs and EZStep could be a protocol worth trying for the management of plantar fasciitis.
Cleland et al., 2009	*N* = 60 70% F 48 ± 8/ NR	Electro + exercise	Manual PT + exercise	LEFS FAAM NPRS	01, 06	6/4	We found both approaches to demonstrate benefits; however, the magnitude of the benefit was more substantial with manual physical therapy and exercise, with between-group differences in function persisting at long-term follow-up.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Greve et al., 2009	*N* = 32 87% F 47 ± 10/3	Exercise	ESWT	VAS algometer Use of analgesics	1.25, 03	10/5	The two evaluated treatments were effective in reducing pain and incapacitation among patients with plantar fasciitis for at least three months after treatment.
Kiran et al., 2022	*N* = 30 NR% F 34.1 ± 6.67/1.5	GT and physical therapy(PT)	Physical therapy (PT)	VAS FHSQ	0.5, 01	NR/4	There was a significant improvement in pain in the GT group compared with the CPT group after the second ($P = 0.005$; partial $\eta^2 = 0.263$) and the 4th ($P = 0.000$; partial $\eta^2 = 0.535$) week of intervention. Foot function was significantly improved ($P<0.05$) in the GT group compared with the CPT group with a large effect size (Cohen's $d = 0.080$). But in the case of general foot health, no significant difference was observed between the groups at the end of the fourth week.
Jones et al., 2019	*N* = 11 NR% F 46 ± 4/ 1.5 to 12	IASTM + conventional	Conventional	NPRS FAAM	01, 03	8/4	Clinically important changes in the IASTM group and moderate-to-large between-group effect sizes suggest that further research is warranted to determine whether these trends are meaningful.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Pant et al., 2018	*N* = 30 NR% F 25 ± 4/3	Myofascial release	Stretching	VAS FFI	01	8/4	Both myofascial release and stretching exercises are effective in treating patients with plantar fasciitis; however, the present study concludes by saying that MFR is better than stretching in 4 weeks intervention.
Sarkar et al., 2018	*N* = 45 60% F 39 ± 9/6	Group 1: Myofascial release + stretching	Group 2: Muscle energy technique + stretching Group 3: Control (stretching)	VAS PPT FFI	01	12/4	Muscle energy technique and myofascial trigger point release along with stretching exercises are effective in reducing pain, improving pressure tolerance, and improving function in subjects with chronic plantar fasciitis.
Kumar et al., 2016	*N* = 30 63.3% F 48 ± 6/6	Myofascial release + stretching	Stretching	VAS PPT FFI	0.5, 0.75	10/2	MFR is effective as a singular mode of treatment in reducing pain & tenderness and improving functional status in subjects with chronic plantar fasciitis.
Kage et al., 2015	*N* = 30 NR% F NR/NR	Myofascial release	Active release	VAS FFI	3 days and 6 days	6/6 days	The myofascial release technique and active release technique both were equally effective in reducing pain and improving functional ability in subjects with plantar fasciitis.
Pattanshetty et al., 2015	*N* = 60 50% F 36 ± 14/3	Group 1: Myofascial release + stretching	Group 2: Positional release + stretching Group 3: Control (stretching)	VAS ROM	After 01 session	1/NA	All three manual techniques with therapeutic ultrasound were effective in the immediate relief of pain and improving ankle range of motion in subjects with chronic plantar fasciitis.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Ajimsha et al., 2014	*N* = 65 73.8% F 41 ± 5/ NR	Myofascial release	Control (sham US therapy)	FFI	01, 03	12/4	The MFR investigated in this trial was more effective than a control intervention with SUST for the treatment of PHP. MFR can be a simple and cost-effective addition to the non-surgical management of PHP.
Shahane et al., 2013	*N* = 60 50% F 50 ± 5/ NR	Myofascial release + stretching	Myofascial release + taping	VAS FFI	5 days and 10 days	10/2	There is a significant reduction in pain intensity and improvement in foot function in both groups after the treatment regime. The results were more significant for myofascial release techniques and stretching.
Yadav et al., 2012	*N* = 60 53.3% F 41 ± 7/ NR	Myofascial release + conventional (PT)	US + conventional (PT)	VAS FFI	10 days	10/10 days	After this study now I use myofascial release as a treatment method for treating PF patients as it is being found to be more effective. It can be given manually. It can also be taught to the patients as a home exercise program.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
AM et al., 2010	*N* = 60 41.6% F 35 ± 13/3	MFR	Positional release	VAS FFI	10 days	10/10 days	Both MFR and PRT along with ultrasound therapy for chronic plantar fasciitis showed improvement following 10 days of treatment as per a significant decrease in pain (VAS) and improvement in functional ability as per FFI which can be used as an effective treatment regime in participants with chronic plantar fasciitis.
Kuhar et al., 2007	*N* = 30 50% F 43 ± 10/ 1.5	Myofascial release + conventional (PT)	Conventional (PT)	VAS FFI	10 days	10/10 days	Although both the conventional treatment and myofascial release have been found to be effective in the alleviation of symptoms and associated disability in plantar fasciitis however the subjects treated with myofascial release showed an additional benefit in terms of reduction of pain on VAS and functional ability in terms of FFI.
McClinton et al., 2019	*N* = 95 74.7% F 50 ± 10/ <12	Podyatric care	Podyatric care + PT	NPRS FAAM	1.5, 06, 12	4/4	There was no significant benefit of uPOD + PT in the primary outcome of FAAM change at 6 months. Secondary outcomes and PP analysis indicated additional benefits of uPOD + PT, mostly observed in individuals who completed treatment.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Johannsen et al., 2019	*N* = 90 57.7% F 45 ± 8/3	Group 1: Steroid injection	Group2: Steroid injection + exercise + stretching Group 3: Exercise + stretching	VAS FFI	03,06,12,24	1 to 3/12	The combined treatment with CS injections and training (strength training and stretching) was proven superior to each of these separately in the treatment of plantar fasciitis.
Thong-On et al., 2019	*N* = 84 73.8% F 55 ± 10/1	Strengthening + PT	Stretching + PT	VAS	0.5, 01, 02, 03	90/12	Both the strengthening and stretching exercise programs could reduce the pain and improve gait performance in patients with PF within 3 months. There were no differences in the testing parameters between the strengthening and stretching groups.
Chawla et al., 2020	*N* = 60 70% F NR/NR	Calf stretching	Fascia stretching	VAS FFI AOFAS	0.25, 0.5, 01	24/4	This study promotes the use of the tissue-specific plantar fascia-stretching protocol as the key exercise. Long-term benefits of stretching include a marked decrease in pain and a high rate of satisfaction.
Sharma et al., 2010	*N* = 13 92.3% F 42 ± 9/ <24	Stretching	Progressive stretching (brace)	PS-FFI AOFAS	01, 02, 03	NA/8	Static stretching, either manual or with a brace, is effective at treating the pain and functional limitations associated with plantar fasciitis.
DiGiovanni et al., 2006	*N* = 66 70.7% F 46 ± 7/10	Plantar fascia-stretching	Achilles tendon-stretching	PS-FFI SROM	24	NA/8	For patients with chronic proximal plantar fasciitis, this study reinforces the value of the plantar fascia-stretching protocol.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
DiGiovanni et al., 2003	*N* = 82 70.7% F 46 ± 7/10	Plantar fascia-stretching	Achilles tendon-stretching	PS-FFI SROM	02	NA/8	A program of non-weight-bearing stretching exercises specific to the plantar fascia is superior to the standard program of weight-bearing Achilles tendon-stretching exercises for the treatment of symptoms of proximal plantar fasciitis.
Radford et al., 2007	*N* = 92 60.8% F 50 ± 11/1	STC + Sham US	Sham US	VAS FHSQ	0.5	15/2	When used for the short-term treatment of plantar heel pain, a two-week stretching program provides no statistically significant benefit in "first-step" pain, foot pain, foot function, or general foot health compared to not stretching.
Hyland et al., 2006	*N* = 41 48.7% F 39 ± 9/ NR	Group 1: STC	Group 2: Taping Group 3: Sham taping Group 4: Control (no treatment)	VAS PSFS	0.25	2/1	Calcaneal taping was shown to be a more effective tool for the relief of plantar heel pain than stretching, sham taping, or no treatment.
Wu et al., 2017	*N* = 36 58.3% F 47 ± 11/6	RF-RT: Ultrasound-guided PRF	Ultrasound-guided LA	VAS AOFAS US	0.25, 01, 02, 03	1/NA	Ultrasound-guided PRF stimulation at the PTN is effective for treating recalcitrant PF. This simple, reproducible method could be a novel strategy for managing recalcitrant PF.
Canyilmaz et al., 2015	*N* = 124 78.2% F 53 ± 9/6	RF-RT: Radiation therapy	Palpation-guided (PG) steroid	VAS MVP 5 LFS	03, 06	6/2	This study confirms the superior analgesic effect of radiation therapy compared to mean PG steroid injection on plantar fasciitis for at least 6 months after treatment.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Niewald et al., 2015	*N* = 127 NR% F 57 ± 9/6	RF-RT: Radiotherapy (12 fractions of 0.5 Gy)—3 sessions per week	RF-RT: Radiotherapy (6 fractions of 1.0 Gy)—2 sessions per week	VAS CS SF-12	0.75, 1.5, 03	9/3	Favorable laboratory results could not be translated into an enhanced pain relief in our patients. This trial was terminated after the interim analysis (127 patients randomized). Further trials will be necessary to explore the best fractionation schedule.
Ye et al., 2015	*N* = 100 38% F 50 ± 12/1	RF-RT: UG-PRF	Sham	VAS FHSQ-Pain FHSQ-Foot Function SF-36	03, 06	3/3	The UG-PRF treatment could significantly reduce pain intensity, foot health, and function, and significantly improve health-related quality of life in comparison with sham treatment in patients with plantar heel pain, without risk for severe complications.
Landsman et al., 2013	*N* = 17 NR% F NR/3	RF-RT: RFNA	Sham	VAS	0.25, 0.5, 0,75, 01, 02, 03, 04	1/NA	Using a prospective, randomized study with sham treatment and crossover, this study demonstrates the efficacy of RFNA for the treatment of plantar fasciitis.
Brook et al., 2012	*N* = 70 75% F 51 ± 15/ NR	RF-RT: PRFE	Placebo	VAS	0.25	7/1	PRFE therapy worn on a nightly basis appears to offer a simple, drug-free, noninvasive therapy to reduce the pain associated with plantar fasciitis. The results from our study indicate that additional studies are warranted to confirm these initial findings.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Niewald et al., 2012	*N* = 62 NR% F 56 ± NR/ 6	RF-RT: Radiotherapy (6 fractions of 1.0 Gy)—2 sessions per week	RF-RT: Radiotherapy (6 fractions of 0.1Gy)—2 sessions per week	VAS CS	03, 12	6/3	This study confirms the superior analgesic effect of radiation therapy with 6-Gy doses on painful heel spurs even for a longer time period of at least 1 year.
Zhu et al., 2022	*N* = 130 45.38% F/ NR 46.55 ± 3.68	Artificial intelligence combined with ultrasound-guided needle knife	Ultrasound-guided needle knife intervention therapy	Curative effects VAS PF thickness AOFAS	0.5, 01, 02	1/NA	AI technology combined with ultrasound-guided needle knife interventional therapy has the advantages of convenient operation, safety, and effectiveness, which is worthy of clinical application. However, our research also has some shortcomings, therefore, our conclusions need to be confirmed by more case studies.
Çatal et al., 2020	*N* = 43 65.1% F 50.42 ± 8.4/6	EPF	Cryosurgery	AOFAS R-M score	03, 06, 12	1/NA	Both EPFR and CS were associated with statistically significant improvements at 1-year follow-up, EPFR was associated with better results and a higher patient satisfaction rate when compared with CS in 3 months.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Johannsen et al., 2020	*N* = 28 67.8% F 47 ± 6/3	EPF	Steroids	VAS FFI	03, 06, 12, 24	1/NA	An operative intervention for PF does seem superior to a well-controlled rehabilitation program. However, the results of the non-operative treatment in this study and in a previous study using the same rehabilitation protocol are very good and would probably suffice for most patients.
Çatal et al., 2017	*N* = 41 70.7% F 51 ± 7/6	EPF (DFA)	EPF (SFA)	VAS AOFAS	0.75, 03, 06, 12	1/NA	Debridement to improve vision in the DFA prolongs the operation time, delays healing, and results in a greater incidence of complications.
Radwan et al., 2012	*N* = 65 38.4% F 38 ± 9/6	EPF	ESWT	VAS AOFAS	0.75, 03, 12	1/NA	High-energy ESWT appears to be a useful noninvasive treatment that may represent a short-term prudent and cost-effective alternative for the treatment of resistant plantar fasciopathy that reduces the necessity for surgical procedures.
Gamba et al., 2019	*N* = 36 79.6% F 48 ± 11/9	OPF	PMGR	VAS AOFAS SF-36 Likert	01, 03, 06, 12	1/NA	PMGR and OPF were both effective and safe surgical options for patients with RPF.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Molund et al., 2018	*N* = 40 77.5% F 45 ± 11/ 12	PMGR + STC	STC	VAS AOFAS	03,2	1/12	PMGR combined with postoperative stretching exercises improved foot function, pain, and general health outcomes for patients with chronic plantar heel pain compared with stretching exercises alone.
Wheeler et al., 2017	*N* = 40 67% F 52 ± NR/ 4	TNS	Control (exercise)	VAS FAAM FFI	1.5, 03	45 to 90/6 to 12	There is a possibility of earlier benefits seen in the intervention group compared with the control group, but data are unclear and further work may be needed.
Sheridan et al., 2010	*N* = 60 76.6% F 49 ± 18/3	TNS	Control (conventional treatment)	VAS	03	90/12	Dynamic splinting was effective in reducing the pain of plantar fasciopathy, and this modality should be included in the standard of care for treating plantar fasciopathy.
Powell et al., 1998	*N* = 37 78.3% F 48 ± 14/6	TNS	Control (no treatment)	VAS AHRS	01, 02, 06	30/4	We believe dorsiflexion splints provide relief from the symptoms of recalcitrant plantar fasciitis in the majority of patients.
Batt et al., 1996	*N* = 40 65.6% F 45 ± 15/ NR	TNS	Control (conventional treatment)	VAS	01, 02, 03	60 to 90/8 to 12	When used in combination with a viscoelastic heel pad, stretching program, and nonsteroidal anti-inflammatory drugs, the TNS is an effective treatment of plantar fasciitis.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Katzap et al., 2018	*N* = 54 66.6% F 51 ± 12/ NR	Therapeutic US	Sham-US	NPRS algometer	01	8/4	The addition of therapeutic ultrasound did not improve the efficacy of conservative treatment for plantar fasciitis.
Latt et al., 2016	*N* = 47 NR% F NR/3	Ultrasound therapy	Sham-ultrasound therapy	FFI-p PROMIS US	0.5, 01, 1.5, 03	NA/2	ITU treatment as compared to sham control lead to a larger and more rapid reduction of heel pain and perifascial lesion size.

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Table 2. (Continued)

Study	Sample Gender Age (years)/ duration of symptoms (months)	Intervention	Comparison	Outcome	Follow-up (months)	Sessions (*n*)/ duration of intervention (weeks)	Key findings
Costantino et al., 2014	*N* = 84 40.4% F 54 ± 9/6	US + cryotherapy (cryoultrasound therapy)	Cryotherapy	VAS	03, 12, 18	10	Cryoultrasound therapy could be an efficient treatment option for chronic plantar fasciitis.

*Significant difference between groups at $P < 0.01$.
100-PSS: 100-points scoring system; 17i-FFI: Italian FFI; 5 LFS: 5-level function score; 6MWT: 6-minute walk test; ABI: autologous blood injection; ACP: autologous conditioned plasma; AFO: ankle foot orthosis; AHRS: AOFAS ankle-hindfoot rating scale; ALD: augmented low-dye; AOFAS: The American Orthopaedic Foot and Ankle Society Ankle-Hindfoot Score; AVBI: autologous venous blood injection; BL 60: acupuncture at Kunlun (BL 60); BPI-VAS: brief pain inventory VAS numeric scale; BTX-A: botulinum toxin type A; CAT: calcific Achilles tendinopathy; c-hAM = cryopreserved human amniotic membrane injection; COMP: the heel pain composite score; CS: corticosteroid; DFA: deep fascial approach; dHACM: micronized dehydrated human amnion/chorion membrane injection; DN: dry needling; EA: electroacupuncture; EAWN: electroacupuncture plus warm needling; EPF: endoscopic plantar fasciotomy; EQ-5D: European quality of life-5 dimensions; ESWT: extracorporeal shock wave therapy; EZStep: a foot brace for the management of plantar fasciitis; F: female; FAAM: the foot and ankle ability measure; FACES: The Wong–Baker FACES Pain Rating Scale; FACIT: functional assessment of chronic illness therapy; FADI: foot and ankle disability index; FAOS: foot and ankle outcome score; FESWT: focused ESWT; FFI: foot function index; FFI-p: pain subscale of foot function index; FHSQ: The foot health status questionnaire; FPDS : foot pain and disability schedule; FS: functional status; FSPS: first-step pain scale; Gastroc: gastrocnemius muscle; GB34: acupuncture at Yanglingquan (GB 34); GB39: acupuncture at Xuanzhong (GB 39); GP: General Practice; GROC: global rating of change; GT: Graston technique; HA: hyaluronic acid; HBEG: home-based exercise group; HILT: high-intensity laser therapy; HPO: Heel-pain orthosis; HTI: heel tenderness index; IASTM: instrument-assisted soft-tissue mobilization; IBTA: incobotulinumtoxin A; IG: insole group; IPG: intensive PT group; IPST: intracorporeal pneumatic shock therapy; IR: infrared; KP: Karlsson-Peterson score; KT: kinesiotaping; LA: local anesthesia; Late Life FDI: late life function and disability instrument; LCI: local corticosteroid injection; LDR: low dose radiation; LDR: low dose radiation; LDT: low-dye taping; LEFS: the lower extremity functional scale; LI 4: Acupoint Hegu (LI 4); LLLT: low-level laser therapy; LPS: Laitinen pain scale; LQ: Laitinen's pain assessment questionnaire; LVCF: last value carried forward; MA: manual acupuncture; MCSS: Mayo clinical scoring system; MCST: minimum clinically successful therapy; MFPDI: Manchester foot pain and disability index; MFR: myofascial release; MFS: Maryland foot score; MOXFQ: Manchester-Oxford foot questionnaire; MPC: monophasic pulsed current; MPFS: Mainz pain staging system; MTrPs: myofascial trigger points; MVP: modified von Pannewitz pain score; N: number of participants; NA: non-applicable; NIN: noninvasive interactive neurostimulation; NMES: neuromuscular electrical stimulation; NPRS or NRS-p: numerical rating scale for pain; NR: non reported; NSAID: nonsteroidal anti-inflammatory drug; OPF: open plantar fasciotomy; PBMT: photobiomodulation therapy; PC 7: Acupoint PC7; PDRN: polydeoxyribonucleotide; PET: problem elicitation technique score; PF: plantar fasciitis; PFPS: PF, pain and disability scale; PHP: plantar heel pain; PHPS: plantar heel pain syndrome; PMGR: proximal medial gastrocnemius release; PNE: percutaneous needle electrolysis; PPP: platelet-poor plasma; PPPD: peak plantar pressure distribution; PPT: pressure pain threshold; Pressure: pressure algometry; PRFE: pulsed radiofrequency electromagnetic field; PROMIS: Patient-Reported Outcomes Measurement Information System; PRP: platelet-rich plasma; PS-FFI: pain sub-scale of the foot function index; PSFS: patient-specific functional scale; PSFS: patient-specific functional scale; PT: physiotherapy; rESWT: radial ESWT; RFNA: radio-frequency nerve ablation; RF-RT: radiofrequency-radiation therapy; R-M: Roles-Maudsley scores; RESWT: radial ESWT; RMS: roles and Maudsley scale; ROM: ankle dorsiflexion range of motion; RS: Rocker-sole; RSWT: radial shock wave therapy; Satisfaction: patient satisfaction; Self: patient's verbally reported percentage improvement; Self-Assess: subject self-assessments questionnaire; SF-12: 12-item short-form health survey score; SF-36 = 36-item short form health survey score; SFA: superficial fascial approach; SFMPQ: short-form McGill pain questionnaire; SMA: self-management advice; SROM: condition-specific outcome measures related to pain, function, and satisfaction with treatment; STC: stretching; SUST: sham ultrasound therapy; TAOCOG: transfer area of the center of gravity; TCI: total contact insole; TNS: tension night splint; TSI: three-spike insole; TT: tenderness threshold; UG: ultrasound-guided; UG-PRF: ultrasound-guided pulsed radiofrequency; US: ultrasound/the thickness and echogenicity of the plantar fascia in ultrasonography; UW: ultrashort waves; VAS: visual analogue scale; VAS-F: VAS function; VAS-S: VAS satisfaction; VISA-A: Victorian Institute of Sport Assessment-Achilles; WB: whole blood; WBLT: weight-bearing lunge test; WHOQOL-BREF: World Health Organization Quality of Life Questionnaire (WHOQOL)'s short version.

Table 3. Meta-analysis results (interventions vs control)

Outcome	Reference no. for included studies	No. of participants	Pooled MD, random-effects model (95% CI)	H - I^2, %	P Value	GRADE
Comparison 1 to 6 wk						
Acupuncture versus control	3	69	−2.05 [−5.48, 1.38]	98	0.24	Low[a,b]
Botulinum toxin versus control	4	161	−2.14 [−4.15, −0.14]	95	0.04	Low[a,b]
Corticosteroid injection versus control	4	244	−1.86 [−3.87, 0.14]	96	0.07	Low[a,b]
dHACM Inj versus control	2	175	−3.31 [−5.54, −1.08]	94	<.01	Low[a,b]
Dry needling versus control	3	215	−2.34 [−4.64, −0.04]	97	0.05	Low[a,b]
ESWT versus control	11	863	−1.27 [−3.84, 1.30]	99	0.33	Low[a,b]
LLLT versus control	5	231	−2.09 [−2.28, −1.90]	0	<.01	Moderate[a]
Low-dye taping versus control	4	213	−3.60 [−4.16, −3.03]	58	<.01	Low[a,b]
Myofascial releases versus control	4	101	−1.79 [−2.63, −0.94]	75	<.01	Low[a,b]
Orthosis versus control	4	259	−0.6 [−1.74, 0.56	65	0.31	Low[a,b]
PRP versus control	2	110	−3.30 [−3.91, −2.69]	94	<.01	Low[a,b]
Radiofrequency versus control	2	87	−2.47 [−4.65, −0.29]	81	0.03	Low[a,b]
Stretching × Control	2	112	−1.14 [−2.02, −0.26]	50	<.01	Low[a,b]
Therapeutic ultrasound versus control	2	97	−0.84 [−4.18, 2.49]	72	0.62	Low[a,b]
Comparison 7 to 12 wk						
ESWT therapy versus control	8	1432	−0.97 [−1.13, −0.81]	0	<.01	Moderate[a]
Orthosis versus control	5	396	−0.74 [−1.49, 0.02]	56	0.06	Low[a,b]
Radiofrequency versus control	2	117	−1.19 [−3.54, 1.15]	84	0.32	Low[a,b]
Tension night splint versus control	2	100	−1.38 [−4.81, 2.05]	96	0.43	Low[a,b]
Comparison >12 wk						
ESWT versus control	3	96	−2.49 [−3.17, −1.82]	0	<.01	Moderate[a]
PRP versus Control	2	88	−1.37 [−4.21, 1.47]	96	0.34	Low[a,b]

There were 10 clinical trials comparing ESWT to control and not 11.
dHACM: micronized dehydrated human amnion/chorion membrane injection, ESWT: extracorporeal shock wave therapy; LLLT: low-level laser therapy; HILT: high-intensity laser therapy; PRP: platelet-rich plasma.
[a]Studies without allocation concealment and/or sample size calculation.
[b]Meta-analysis with statistical significance in heterogeneity test and high I^2.

Table 4. Meta-analysis of the different therapeutic interventions.

Outcome	Reference no. for included studies	No. of participants	Pooled MD, random-effects model (95% CI)	H–I^2, %	*P*-value	GRADE
Comparison 1 to 6 wk						
CI x ozone therapy	[2]	74	−1.37 [−2.27, −0.47]	25	<.01	Low[a,b]
ESWT versus CI	[5]	343	−1.13 [−2.29, 0.03]	96	0.06	Low[a,b]
Autologous blood injection versus CI	[5]	306	−1.33 [−2.21, −0.45]	72	<.01	Low[a,b]
ESWT versus LLLT	[4]	175	−0.47 [−2.81, 1.87]	94	0.69	Low[a,b]
PRP versus CI	[9]	511	0.15 [−0.56, 0.87]	93	0.67	Low[a,b]
ESWT versus therapeutic ultrasound	[5]	174	−0.55 [−1.63, 0.53]	88	0.32	Low[a,b]
LLLT versus HILT	[2]	172	−1.72 [−4.86, 1.41]	96	0.28	Low[a,b]
Custom orthosis versus prefabricated orthosis	[3]	304	−1.07 [−3.26, 1.11]	93	0.34	Low[a,b]
US-guided CI versus palpation-guided CI	[2]	75	−2.92 [−9.92, 4.08]	98	0.41	Low[a,b]
Comparison 7 to 12 wk						
Ozone therapy versus CI	[2]	74	−0.40 [−1.19, 0.38]	4	0.31	Moderate[a]
ESWT versus CI	[6]	440	−1.67 [−2.56, −0.79]	93	<.01	Low[a,b]
Autologous blood injection versus CI	[4]	256	−0.51 [−1.55, 0.53]	78	0.33	Low[a,b]
PF stretching versus muscle stretching	[2]	148	−1.90 [−2.12, −1.67]	0	<.01	Moderate[a]
PRP versus CI	[6]	356	−0.08 [−0.89, 0.73]	95	0.84	Low[a,b]
Custom orthosis versus prefabricated orthosis	[4]	465	−0.11 [−0.69, 0.60]	38	0.72	Low[a,b]
Comparison >12 wk						
Autologous blood injection versus CI	[4]	250	−0.40 [−1.38, 0.58]	75	0.42	Low[a,b]
PRP versus CI	[5]	320	−1.87 [−3.91, 0.16]	97	0.07	Low[a,b]
BTX versus CI	[3]	134	−1.52 [−3.06, 0.02]	92	0.05	Low[a,b]

CI: corticosteroid injection; ESWT: extracorporeal shock wave therapy; LLLT: low-level laser therapy; HILT: high-intensity laser therapy; PRP: platelet-rich plasma PF: plantar fascia; GRADE: Grading of Recommendations Assessment, Development and Evaluation; BTX: botulinum toxin.

[a]Studies without allocation concealment and/or sample size calculation.

[b]Meta-analysis with statistical significance in heterogeneity test and high I^2.

custom orthosis and prefabricated orthosis. The meta-analyses showed a non-significant difference in pain for participants in the custom orthosis group versus the prefabricated orthosis group. Two studies[121,126] (172 participants) compared high-intensity laser therapy and low-level laser therapy. The meta-analyses showed a non-significant difference in pain for participants in the high-intensity laser therapy group versus the low-level laser therapy group. Two studies[106,109] (75 participants) compared ultrasound-guided corticosteroid injection and palpation-guided corticosteroid injection. The meta-analyses showed a non-significant difference in pain for participants in the ultrasound-guided corticosteroid injection group versus the palpation-guided corticosteroid injection group.

The quality of evidence for pain was assessed as being low for all comparisons of different interventions. The GRADE assessments are presented in Table 4.

Pain in the medium term

Eighteen studies (2163 participants) compared four different therapeutic interventions to the control group in the medium term. Extracorporeal shock wave therapy ($n = 1432$[60,69,72,74,75,77,81,86]), orthosis ($n = 396$[141,146,148,151,160]), radiofrequency ($n = 117$[203,204]), and tension night splint ($n = 100$[246,247]). A summary of the meta-analyses performed to compare interventions versus controls is shown in Table 3. In the pairwise meta-analysis, the one intervention pair that had 95% CIs beyond the null value, which was considered to represent significant differences, was extracorporeal shock wave therapy versus control.

The GRADE assessments are presented in Table 3. Compared to the control, the quality of evidence for pain with extracorporeal shock wave therapy was assessed as moderate. For all other interventions compared to the control, the quality of evidence for pain was assessed as being low.

A summary of the meta-analysis performed to compare different interventions is shown in Table 4. Six studies[50,52,58,62,68,183] (440 participants) compared extracorporeal shock wave therapy versus corticosteroid injection. The meta-analyses showed a significant improvement in pain for participants in the extracorporeal shock wave therapy group versus the corticosteroid injection group. Two studies[228,229] (148 participants) compared plantar fascia stretching and muscle stretching. The meta-analyses showed a significant improvement in pain for participants in the plantar fascia stretching group versus the muscle stretching group.

Six studies[176,181,184,186,187,190] (356 participants) compared corticosteroid injection and platelet-rich plasma. The meta-analyses showed a non-significant difference in pain for participants in the corticosteroid injection group versus the platelet-rich plasma group. Four studies[168–170,172] (256 participants) compared corticosteroid injection and autologous blood injection. The meta-analyses showed a non-significant difference in pain for participants in the corticosteroid injection group versus the autologous blood injection group. Four studies[145,150,151,154] (465 participants) compared custom orthosis and prefabricated orthosis. The meta-analyses showed a non-significant difference in pain for participants in the custom orthosis group versus the prefabricated orthosis group. Two studies[164,165] (74 participants) compared ozone therapy and corticosteroid injection. The meta-analyses showed a non-significant difference in pain for participants in the ozone therapy group versus the corticosteroid injection group.

The quality of evidence for pain was assessed as being moderate for comparisons between (plantar fascia stretching versus muscle stretching) and (ozone therapy versus corticosteroid injection). The quality of evidence for pain was assessed as low for other comparisons. The GRADE assessments are presented in Table 4.

Pain in the long term

Five studies (184 participants) compared two different therapeutic interventions for the control group in the long term. Extracorporeal shock wave therapy ($n = 96$[70,80,83]) and platelet-rich plasma ($n = 88$[180,181]). A summary of the meta-analyses performed to compare interventions versus controls is shown in Table 3. In the pairwise meta-analysis, the one intervention pair that had 95% CIs beyond the null value, which was considered to represent significant differences, was extracorporeal shock wave therapy versus control.

The GRADE assessments are presented in Table 3. Compared to the control, the quality of evidence for pain with extracorporeal shock wave therapy was assessed as moderate. The quality of evidence for pain with platelet-rich plasma was assessed as being low.

A summary of the meta-analyses performed to compare different interventions is shown in Table 4. Four studies[169–171,173] (250 participants) compared corticosteroid injection and autologous blood injection. The meta-analyses showed a non-significant difference in pain for participants in the corticosteroid injection group versus the autologous blood injection group. Five studies[176,178,183,189,191]

(320 participants) compared corticosteroid injection and platelet-rich plasma. The meta-analyses showed a non-significant difference in pain for participants in the corticosteroid injection group versus the platelet-rich plasma group. Three studies[26,30,32] (134 participants) compared botulinum toxin and corticosteroid injection. The meta-analyses showed a non-significant difference in pain for participants in the botulinum toxin group versus the corticosteroid injection group.

The quality of evidence for pain was assessed as being low for all comparisons of the different interventions. The GRADE assessments are presented in Table 4.

Discussion

This systematic review suggests that botulinum toxin, micronized dehydrated human amnion/chorion membrane injection, dry needling, low-dye taping, low-level laser therapy, myofascial releases, platelet-rich plasma, radiofrequency, and stretching resulted in effective treatments for pain when compared to the control in the short term. In the medium and long term, only extracorporeal shock wave therapy was effective in improving pain when compared to the control. The relevance of this systematic review relies on the comparison between all different therapeutic interventions, analyzing the effect sizes of different interventions in relation to a control group without active intervention, as well as comparing different active interventions as a potential treatment for pain in patients with plantar fasciitis.

In the short term, corticosteroid injection was effective in improving pain when compared to autologous blood injection, ozone therapy, and orthosis. In addition, soft-tissue mobilization combined with conventional physiotherapy was effective for improving pain when compared with conventional physiotherapy only. In the short term, there was no superiority when two different interventions (corticosteroid injection versus platelet-rich plasma, extracorporeal shock wave therapy versus corticosteroid injection, extracorporeal shock wave therapy versus therapeutic ultrasound, extracorporeal shock wave therapy versus low-level laser therapy, custom orthosis versus prefabricated orthosis, high-intensity laser therapy versus low-level laser therapy, and ultrasound-guided corticosteroid injection versus palpation-guided corticosteroid injection) were compared.

In the medium term, extracorporeal shock wave therapy was effective in improving pain when compared to corticosteroid injection. In addition, plantar fascia stretching was effective for improving pain when compared to muscle stretching. In the medium term, there was no superiority when different interventions (corticosteroid injection versus platelet-rich plasma, corticosteroid injection versus autologous blood injection, custom orthosis versus prefabricated orthosis, and ozone therapy versus corticosteroid injection) were compared.

In the long term, there was no superiority when different interventions (corticosteroid injection versus autologous blood injection, corticosteroid injection versus platelet-rich plasma, and botulinum toxin versus corticosteroid injection) were compared.

These findings add to the growing body of literature indicating that different therapeutic interventions are beneficial for persons with plantar fasciitis, as well as identified the non-effective therapeutic interventions for the treatment of pain in this population. Despite the benefits of some interventions, we identified studies with moderate and low methodological quality which compromised the quality of the evidence. We assessed the quality of evidence of meta-analysis according to the GRADE system, which ranked the most as low quality and only five as moderate quality.

The results of this systematic review should be interpreted with caution due to a variety of reasons. In general, most randomized controlled trials compared patients randomized for receiving a specific therapeutic intervention to patients randomized for a control group. Only a few randomized controlled trials have provided a direct comparison between different therapeutic interventions. There is still a need to develop randomized controlled trials powered to compare clinical endpoints between different therapeutic interventions in

patients with plantar fasciitis. In addition, caution is warranted when interpreting our results. Most of the included studies had a small sample size, which may contribute to the identified heterogeneity. This high heterogeneity and the moderate-to-low methodological quality of studies included in the meta-analyses are factors that reduce the quality of the evidence. Despite most of them being ranked as low quality, only five were of moderate quality, reinforcing the need for new studies with high quality and future research to be developed. Well-controlled randomized controlled trials that compared the different therapeutic interventions are required to reinforce the recommendation of a certain therapeutic intervention as an important treatment for patients with plantar fasciitis.

This systematic review and meta-analysis showed that different therapeutic interventions seem to be a useful strategy for improving pain in patients with plantar fasciitis and the duration of treatment can be an important factor when choosing which therapeutic intervention to use. A large-scale trial with long-term follow-up is warranted for one or two of the interventions due to the lack of strong evidence to support any single intervention.

Clinical messages

- Different therapeutic interventions resulted in being effective treatments for pain when compared to the control in the short term. In the medium and long term, only extracorporeal shock wave therapy was effective for improving pain when compared to the control.
- In the medium term, extracorporeal shock wave therapy was effective for improving pain when compared to corticosteroid injection. In addition, plantar fascia stretching was effective for improving pain when compared to muscle stretching.
- In the long term, there was no superiority when two different interventions were compared.

Author's note

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Supplemental material

Supplemental material for this article is available online.

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