International Centre for Allied Health Evidence

University of South Australia

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Systematic Review of the Literature

The Effectiveness of Injection of Steroid with or without Local Anaesthetic to the Plantar Fascia

Prepared for:
Amanda Bowens,
Information Specialist
The Accident Compensation Corporation
PO Box 242
Wellington 6011
New Zealand

Prepared by:
International Centre for Allied Health Evidence
University of South Australia
Adelaide
SA 5000
Australia

RESEARCH CENTRE RESPONSIBLE FOR THE PROJECT

International Centre for Allied Health Evidence
School of Health Sciences
City East Campus
University of South Australia
Adelaide
South Australia 5000
Website: www.unisa.edu.au/cahe

Review team
Heath Pillen
Steve Milanese
Karen Grimmer
Ashley Fulton
Holly Bowen
Emile Sach

Centre Director
Professor Karen Grimmer
Phone: (08) 8302 2769
Fax: (08) 8302 2766
Email: karen.grimmer@unisa.edu.au

Project administrator
Ms. Madeleine Mallee
Business Services Officer
Business Development Unit
Division of Health Sciences
University of South Australia
Phone: (08) 8302 2121
Fax: (08) 8302 1472
Email: madeleine.mallee@unisa.edu.au

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Table of Contents

Contents

Abbreviations

The following abbreviations are used in this report and are listed here for convenience.

Abbreviation	
ABI	Autologous blood injection
BTX-A	Botulinum toxin type A
PF	Plantar fasciitis
CCT	Controlled clinical trial
CSI	Corticosteroid injection
c-hAM	Cryopreserved human amniotic membrane
ESWT	Extracorporeal shock wave therapy
iCAHE	International Centre for Allied Health Evidence
NSAIDs	Non-Steroidal Anti-Inflammatory Drugs
PF	Plantar fasciitis
PRP	Platelet-rich plasma
RCT	Randomised controlled trial
SIGN	Scottish Intercollegiate Guidelines Network
SR	Systematic review
US	Ultrasound
Quality Ratings	
AQ	Acceptable Quality
CS	Can't say
HQ	High Quality
QS	Quality of Study
LQ	Low Quality
NA	Not Applicable
R	Reject (Unacceptable Quality)

Executive Summary

Objective of the Review	The objective of this review is to synthesise the evidence related to the effectiveness of injection of steroid to the plantar fascia as a form of interventional pain management for plantar fasciitis/fasciopathy. This review aims to answer the following research questions: a) What is the evidence for the effectiveness of steroid injections to the plantar fascia in relieving plantar heel pain? b) What is the evidence for the effectiveness of steroid injections to the plantar fascia in improving functional outcomes in patients? c) What is the evidence for the safety of steroid injections to the plantar fascia?
Evidence sourced	The search yielded 657 articles. After scrutiny, 582 articles were excluded as duplicates or failing to meet the inclusion criteria, leaving 75 studies for inclusion in this review including 11 systematic reviews, 34 randomised controlled trials, eight controlled clinical trials, one case-control study, and 23 case study or case series reports.
What is the evidence for the effectiveness of steroid injections to the plantar fascia in relieving pain and/or in improving functional outcomes in patients with plantar fasciitis or fasciopathy?	**Evidence of Effectiveness against Placebo** • Steroid injection to the plantar fascia appear to be effective at reducing pain in the short-term (<3months post-treatment) when compared to placebo, but fails to offer any significant benefit in the long-term (Grade of Recommendation: A, based on one HQ SR, one HQ RCTs, one AQ SR, and two LQ SRs) **Evidence of Effectiveness compared with Conservative (non-invasive) Treatments** • Steroid injection to the plantar fascia is likely to be more effective at reducing pain in the short-term (<3months post-treatment) compared with physical therapies; however, has comparable effectiveness in the long-term (Grade of Recommendation: B, based on one HQ SR and one HQ RCT) • Steroid injection is more effective than use of silicone insoles at reducing pain in the short-term (<3 months post-treatment), with inconsistent results for relative long-term effectiveness (Grade of Recommendation B: based on one HQ RCT) • Steroid injection comparable to extracorporeal shockwave therapy in reducing pain in the long-term (≥3 months post-treatment), with inconsistent results regarding short-term effectiveness (Grade of Recommendation: B, based on one HQ SR, one HQ RCT, and one AQ RCT) **Evidence of Effectiveness compared with Alternative (invasive) Treatments** • Steroid injection is superior to autologous blood injection at reducing pain in the short-term (<3months post-treatment); however, has comparable effectiveness in the long-term (Grade of Recommendation: B, based on two HQ SRs, one LQ SR, and one LQ RCTs) • Steroid injection is inferior to injection with botulinum toxin type A at reducing pain in the short and long-term (Grade of Recommendation B: based on one HQ RCT) • Steroid injection is inferior to miniscalpel-needle release treatment at reducing pain in the short and long-term (Grade of Recommendation B: based on one HQ RCT)

	Insufficient Body of Evidence • Although the body of low-quality RCTs suggest that steroid injection is inferior to platelet rich plasma injections at reducing pain in the short and long-term, no high quality studies currently exist. • Only one low-quality RCT compared the effectiveness of steroid injection to radiation therapy.
What is the evidence for the safety of steroid injections into the plantar fascia?	**Steroid injection is associated with increased risk of rupture of the plantar fascia** (Grade of Recommendation: D, based on one AQ case-control study)
What is the evidence for differences in effectiveness if imaging is used?	**Evidence of Effectiveness by Guidance Method** There is no difference in pain outcome for steroid injections delivered with ultrasound or palpation guidance (Grade of Recommendation B: based on one HQ RCT)
Does the evidence report any information about cost effectiveness?	No systematic review, experimental study, or observational study identified within this search provided an economic analysis of steroid injection in the treatment of plantar fasciitis/fasciopathy.

1. Background

1.1 Objective of this Review

The objective of this review is to synthesise the evidence related to the effectiveness of injection of steroid, with or without local anaesthetic, to the plantar fascia as a form of interventional pain management for plantar heel pain arising from plantar fasciitis (PF) or plantar fasciopathy. This review will carry out a systematic review of the best available research evidence. This review aims to answer the following research questions:

a) What is the evidence for the effectiveness of steroid injections to the plantar fascia in relieving plantar heel pain?
b) What is the evidence for the effectiveness of steroid injections to the plantar fascia in improving functional outcomes in patients?
c) What is the evidence for the safety of steroid injections to the plantar fascia?

1.2 Description of the Intervention

The injection of corticosteroid to the plantar fascia has historically been regarded as an effective treatment for plantar fasciitis, either as a first-line treatment or more commonly following an unsatisfactory response to conservative treatments such as stretching exercises, splinting and walking casts, non-steroidal anti-inflammatory drugs, heel pads, or orthotic devices (Kirkland & Beeson, 2013; Lim, How, & Tan, 2016; Uden et al, 2011).

Plantar fasciitis (or plantar fasciopathy) is one of the most common disorders of the foot (Lee & Ahmad, 2007), causing pain and tenderness under the heel that is characteristically worse during the first steps on getting up from bed in the morning or after periods of inactivity, with pain exacerbated by prolonged standing or walking (Diaz-Llopis et al., 2012). It is estimated that plantar fasciitis will affect 15% of adults within their lifetime and accounts for approximately 25% of all foot injuries related to running (Kirkland & Beeson, 2013). Although plantar fasciopathy typically resolves without intervention, resolution of pain and associated disability can take up to 18 months (Kirkland & Beeson, 2013), highlighting a need for intervention in the short to medium term to relieve pain and improve function.

Although its aetiology is not well understood, it is generally recognised that the causes of plantar fasciitis are multifactorial and involve both inflammatory and degenerative processes, although the relative extent to which these processes affect the disease process is debated. It is generally recognised that over time, mechanical overload and biomechanical abnormalities of the foot contribute to repetitive micro trauma and micro tears, which impair normal healing processes thereby resulting in a chronic inflammatory reaction (Kirkland & Beeson, 2013).

Steroid injections to the plantar fascia have commonly been used in recalcitrant cases of plantar fasciitis, where conservative therapies have failed to bring about relief. Uncertainty regarding the mechanisms of action of steroid injections reflect a broader uncertainty regarding the physiological processes underlying plantar fasciopathy, although likely mechanisms of action involve limiting capillary dilation, reducing the permeability of vascular structures, reducing prostaglandin release, inhibiting fibroblast proliferation, and inhibiting the expression of group substance proteins (Kirkland & Beeson, 2013).

Although the choice of injectate varies, methylprednisolone is often used because of its solubility and short/medium duration of action (Gross & Lin, 2012). Although steroids with greater solubility (e.g. methylprednisolone and dexamethasone phosphate) have a shorter duration of action when compared to less soluble steroids, they are also thought to reduce the risk of post-injection flare and soft tissue atrophy (McMillan et al., 2012). Fluorinated steroids (such as the relatively insoluble triamcinolone) are thought to have greater anti-inflammatory action, but are also associated with collagen degradation and increased risk of plantar fascia rupture (McMillan et al., 2012). Local anaesthetic is typically added to steroid injectate because of its ability to provide temporary pain relief and dilute crystal deposits from acetate-steroids (McMillan et al., 2012).

After localisation of the point of maximal tenderness, injection is typically made from the medial side, perpendicular to the skin and past the midline of the width of the plantar foot, with the needle point under the point of maximum tenderness. The site of injection depends on the site of pain, although the most common site is the medial calcaneal tuberosity. Injection can be made either under ultrasound guidance or by palpation of the plantar fascia (Gross & Lin, 2012). Injection may also be performed to the posterior heel, parallel to the heel pad (Ball et al., 2013), or via a medial oblique approach (McMillan et al., 2012).

The injection technique used can either involve evenly injecting the injectate across the middle third of the width of the foot as the needle is withdrawn (Gross & Lin, 2012) or by using a peppering technique that involves multiple penetrations of the fascia with a single skin portal (Guner et al., 2013).

1.3 Safety/Risk

Steroid injections to the plantar fascia are usually associated with transient localised pain at the injection site (Kalaci et al., 2009; Porter & Shadbolt, 2005; Uden et al., 2011), with evidence of less common minor side effects of abscess formation (Buccilli et al., 2005) and infection (Patil et al., 2015).

Fascial rupture and fat pad atrophy are two serious complications that may result from injection to the plantar fascia. Fascial rupture has previously been identified in as many as 10% of patients injected with steroid (Acevedo & Beskin, 1998), although it is argued elsewhere that incidence is much lower (2.4%) and injection is a contributing factor in combination with other coexisting factors such as obesity (Kim et al., 2010). Triamcinolone in particular has been implicated in predisposing tendons to spontaneous rupture through suppression of tenocyte cellular activity and collagen production (Wong et al., 2004). Fat pad atrophy can arise from mis-injection into the fat pad resulting in reduced subcalcaneal cushioning and predisposing the plantar fascia to further injury, although its risk is greatly reduced with ultrasound-guided injection (Tsai et al., 2000). Other reported serious complications have come from case studies and include calcaneal osteomyelitis (Gidumal & Evanski, 1985), lateral plantar nerve palsy (Snow et al., 2005), and peripheral nerve injury (Speed, 2007).

It has been recommended that ultrasound guidance should be utilised to improve injection accuracy, reducing the need for repeat injections and thus reducing the risk of plantar fascia rupture and plantar fat pad atrophy (Hall, 2013; Tatli & Kapasi, 2009; Tsai et al., 2000).

2. Methodology

2.1 Review question

What is the effectiveness of steroid injection to the plantar fascia with or without local anaesthetic?

2.2 Methods

A systematic review of published research literature was undertaken to provide a synthesis of the currently available research evidence related to the effectiveness of steroid injections to the plantar fascia with or without local anaesthetic as a form of interventional pain management for plantar fasciitis/fasciopathy. A systematic and rigorous search strategy was developed to locate all published and accessible research evidence. The evidence base for this review included research evidence from existing systematic reviews, meta-analyses, and high-level primary research (randomised controlled trials and prospective cohort studies). Where no systematic reviews, randomised controlled trials, or prospective cohort studies were located, other primary study designs (excluding commentary and expert opinion) were considered.

2.3 Search strategy

The search was developed using a standard PICO structure, shown in Table 1. Only English-language articles using human participants were included in this review.

Table 1: Criteria for considering studies in the review

Population	Humans diagnosed with plantar fasciitis/fasciopathy or plantar heel pain
Intervention	Steroid injection to the plantar fascia with or without local anaesthetic as a form of interventional pain management
Comparator	Any active treatment or placebo
Outcomes	• Pain-related primary outcomes • Functional outcomes (range of motion, reduction of disability, return to work, quality of life) • Safety and risk • Relationship to Imaging • Best practice recommendations • Cost effectiveness

A combination of search terms (shown in Table 2) were used to identify and retrieve articles in the following databases:

OVID

- EMBASE,
- MEDLINE,
- MEDLINE Epub Ahead of Print
- AMED,
- CINAHL,
- The Cochrane Library,
- Scopus,
- Scopus,
- Web of Science,

Table 2: Search terms for the review

Search terms 1	Search terms 2	Search terms 3	Search terms 4
• Pain	• Injection	• Heel • Plantar Fasciitis • Heel spur • Plantar aponeurosis	• Steroid • Betamethasone • Dexamethasone • Fluocortolone • Methylprednisolone • Paramethasone • Prednisolone • Prednisone • Triamcinolone • Hydrocortisone • Cortisone • Methandrostenolone • Stanozolol • Methenolone • Oxymetholone • Oxandrolone • Nandrolone • Diflucortolone • Fluprednisolone

The titles and abstracts identified from the above search strategy were assessed for eligibility by the *i*CAHE researchers. Full-text copies of eligible articles were retrieved for full examination. Reference lists of included full-text articles were searched for relevant literature not located through database searching. The search string used in the Medline search is provided in Appendix 1.

2.4 Study Selection

Inclusion Criteria

- Study Types: systematic reviews, all primary research designs (randomised controlled trials (RCTs), controlled clinical trials (CCTs), cohort studies (prospective or retrospective), case-control studies, case studies or case series.
- Participants: patients clinically diagnosed with plantar fasciitis/fasciopathy or plantar heel pain
- Intervention: steroid injections, with or without local anaesthetic, delivered to the plantar fascia
- Controls: any active treatment, placebo, or no intervention control
- Outcomes: pain relief (primary), functional outcomes, safety, and risk (secondary)
- Publication criteria: English language, published in peer reviewed journal

Exclusion criteria

- Studies only available in abstract form (e.g. conference presentations)
- Grey literature and non-English language material
- Studies involving healthy volunteers or experimentally induced pain
- Studies on interventions targeting heel pain but not involving injections delivered to the planta fascia

2.5 Critical Appraisal

The SIGN (Scottish Intercollegiate Guidelines Network) checklist specific to the study design of the included studies was used to assess the methodological quality of the included studies (Appendix 2). The SIGN checklist asks a number of questions with yes, no, can't say or not applicable as responses with the appraiser giving an overall rating of quality, based on the responses to questions of either high quality (++), acceptable (+), low quality (-) or unacceptable/rejected. As there is no SIGN checklist for case studies these study designs will not be quality scored. Each study was graded for overall methodological quality using the SIGN levels of evidence model.

2.6 Data Extraction

Data were extracted from the identified publications using a data extraction tool that was specifically developed for this review. The following information were extracted from individual studies:

- Evidence source (author, date, country)
- Level of evidence
- Characteristics of participants
- Interventions (type of steroid, dose, approach, use of anesthetic)
- Comparison treatment (if relevant)
- Outcome measures
- Results and study conclusion

2.7 Data Synthesis

As described, for this review each study was graded for overall methodological quality using the SIGN checklist specific to the study design of the included studies.

Recommendations from the literature were made and scored according to a modification of the SIGN Evidence Grading matrix (see Table 3). The modification was to add levels 1 and 2 to differentiate between the 1+ and 1-, 2+ and 2- levels of evidence.

Table 3 : Modified SIGN Evidence Grading Matrix

Levels of scientific evidence	
1++	High-quality meta-analyses, high-quality systematic reviews of clinical trials with very little risk of bias
1+	Well-conducted meta-analyses, systematic review of clinical trials or well-conducted clinical trials with low risk of bias
1	Meta-analyses, systematic review of clinical trials or clinical trials with a moderate (acceptable) level risk of bias.
1-	Meta-analyses, systematic reviews of clinical trials or clinical trials with high risk of bias.
2++	High-quality systematic reviews of cohort or case and control studies; cohort or case and control studies with very low risk of bias and high probability of establishing a causal relationship
2+	Well-conducted cohort or case and control studies with low risk of bias and moderate probability of establishing a causal relationship
2	Cohort or case and control studies with moderate risk of bias and potential risk that the relationship is not causal.
2-	Cohort or case and control studies with high risk of bias and significant risk that the relationship is not causal.
3	Non-analytical studies, such as case reports and case series.
4	Expert opinion.

To standardise the strengths of recommendations from the extensive literature used for this review a structured system was developed to incorporate a number of quality measures. Four measures were selected as important variables for the assessment of strength of recommendations from the primary and secondary research sources. These were

a) Combination of data via meta-analysis

b) Quality of systematic review/trials

c) Number of RCTs

d) Consistency of the evidence

A scoring system was developed, based on a 0 and 1 score for each of these variables.

1. Combination of data via meta-analysis : Yes = 1, No = 0
2. Quality of systematic review: HQ/AQ (+) =1, LQ(0)/R = 0
3. Number of RCTs: ≥ 5RCTs = 1, < 5=0
4. Consistency: ≥ 75% agreement = 1, < 75% agreement = 0

This allowed for a maximum potentials core of 4 and a minimum score of 0, which reflected a measure of the evidence strength across a range of studies. The resultant score was transferred to the SIGN Evidence Grading matrix

Total Score	SIGN Evidence Grading matrix score
4	1++
3	1+
2	1
1/0	1-

2.8 Grades of Recommendations

Recommendations were graded according to the Scottish Intercollegiate Guidelines network (SIGN) Grades of Recommendations (Table 4).

Table 4: Scottish Intercollegiate Guidelines network (SIGN) Grades of Recommendations

Grades of Recommendations	
A	At least one meta-analysis, systematic review or clinical trial classified as 1++ and directly applicable to the target population of the guideline, or a volume of scientific evidence comprising studies classified as 1+ and which are highly consistent with each other.
B	A body of scientific evidence comprising studies classified as 2++, directly applicable to the target population of the guideline and highly consistent with each other, or scientific evidence extrapolated from studies classified as 1++ or 1+.
C	A body of scientific evidence comprising studies classified as 2+, directly applicable to the target population of the guideline and highly consistent with each other, or scientific evidence extrapolated from studies classified as 2++.
D	Level 3 or 4 scientific evidence, or scientific evidence extrapolated from studies classified as 2+

3. Results

3.1 Evidence Sources

The search yielded 657 articles in total. Following removal of duplicates 345 articles were identified for screening of title and abstract. After scrutiny, 270 articles were excluded for failing to meet the inclusion criteria, leaving 75 studies for inclusion in this review. Figure 1 illustrates the process involved in study selection.

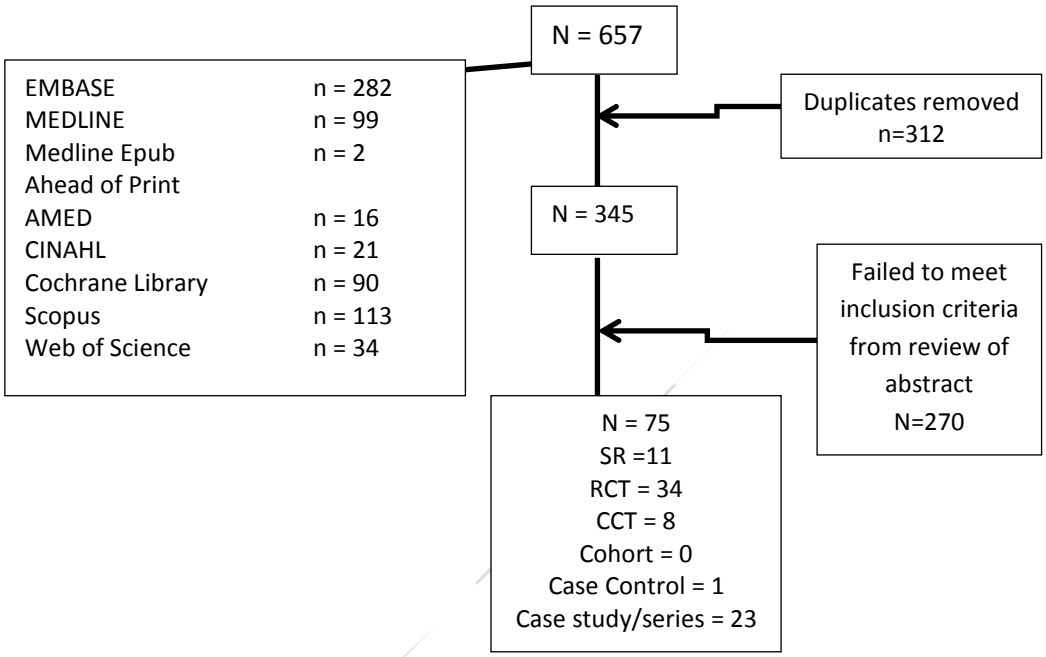

Figure 1: Flow chart of search results

3.2 Quality of the Evidence

Nine systematic reviews (SR) met the inclusion criteria, including four high-quality SRs (Crawford et al. 2002; Crawford & Thomson, 2003; Tsikopoulos et al., 2016; Uden et al., 2011), two adequate quality reviews (Atkins et al., 1999; Z. Li et al., 2015), and three low quality reviews (Ang, 2015; Lafuente Guijosa et al., 2007; Tatli & Kapasi, 2009). The Cochrane SR by Crawford and colleagues (Crawford & Thomson, 2003) was included in this review because of its quality; however, it is recognised that this review was withdrawn in 2010 because it was considered 'substantially out-of-date' by the Cochrane Bone, Joint and Muscle Trauma Editorial Group (Crawford & Thomson, 2010).

Randomised controlled trials (RCTs) were only included if they were published between 2005 and 2016 and were not incluced in the SRs above. This left four high quality studies (Celik et al., 2016; Eslamian et al., 2016; Li et al., 2014; Mahindra et al., 2016), one adequate quality study (Mardani-Kivi et al., 2015), 13 low quality studies (Ahmed et al, 2013; Al-Bluwi et al. 2011; Biswas et al., 2011; Canyilmaz et al., 2015; Chen et al., 2013; Hanselman et al. 2015; Jain et al., 2015; Monto, 2014; Saba & El-Sherif, 2016; Tsai et al., 2006; Yesiltas et al., 2015; Yucel et al., 2010; Yucel et al. 2009), and five studies that were rejected because of insufficient reporting on which to base an assessment of quality (Motififard et al., 2008; Mulherin & Price, 2009; Narula et al., 2014; Omar et al., 2012; Tiwari & Bhargava, 2013).

	No prospective or retrospective cohort studies were located, although one case-control study was located and included within this review (Lee et al., 2014). Other observational studies employed lower level designs (case studies or case series) and were not included within this review. Full details of the quality appraisal of individual studies can be found in appendices 3, 4, and 5 (critical appraisal for systematic reviews, randomised controlled trials, and case-control studies).
3.3 Findings	All 11 included systematic reviews examined heel pain as the primary outcome, with some also reporting on outcomes related to heel function (Atkins et al., 1999) or anatomical changes to the plantar fascia (Ang, 2015; Atkins et al., 1999; Li et al., 2015). The number of included studies in each review ranged from one to 10 randomised controlled trials, comparing steroid injection against placebo or alternative treatments for plantar fasciitis that included exercise and stretching, insoles, heel pads or orthotic devices, night splints, autologous blood, botulinum toxin type A, and electro hydraulic/extracorporeal shock wave therapy. The strength of evidence (according to SIGN levels of evidence rating) within each of these reviews ranged from 1- to 1+. Only two SRs provided a meta-analysis of results (Li et al., 2014; Tsikopoulos et al., 2016). Nineteen RCTs published between 2006 and 2016 that were not included in the reported SRs and not rejected because of poor quality were also reviewed. Included studies compared steroid injection to placebo injection, oral non-steroidal anti-inflammatory drugs, physical therapies, orthotic devices, botulinum toxin, cryopreserved human amniotic membrane, extracorporeal shockwave therapy, autologous blood or platelet-rich plasma injection, radiation therapy, and miniscalpel needle release treatment. All studies reported on outcomes of heel pain, with some also reporting on functional and anatomical outcomes. One study compared the effectiveness of different steroid types (Ahmed et al., 2013), four examined differences in outcome according to guidance method used (Chen et al., 2013; Saba & El-Sherif, 2016; Tsai et al., 2006; Yucel et al., 2009) Full details of individual studies can be found in Appendix 6 (full data extraction).

3.4 Outcome Measures – Pain and Function

Systematic Reviews

Steroid Injection versus Placebo

Li et al., (2015)

Li et al. (Li et al., 2015) conducted a meta-analysis of four RCTs (N = 289) comparing steroid injection with placebo injection on outcomes of heel pain and plantar fascia thickness for patients diagnosed with plantar fasciitis (PF). Use of steroid injection was found to produce significant improvements in pain compared to placebo at one month; however, there was no significant difference at either two or three months post-treatment. No significant difference in plantar fascia thickness was observed for treatment with steroid injection or placebo. Thus it was concluded that steroid injection is effective at reducing pain in the short-term, with a loss of therapeutic effectiveness at two and three months.

Study	QS	Conclusions	Level of Evidence
Li et al (2015)	AQ (+)	• Corticosteroids resulted in significant improvement in pain compared to placebo after one month; however there was no significant difference after two or three months. • No significant difference was found in plantar fascial thickness for those treated with steroid or placebo.	1

Tatli & Kapasi (2009)

In a low quality systematic review by Tatli & Kapasi (Tatli & Kapasi, 2009), a single RCT by Crawford et al. (Crawford et al, 1999) (N=91) was examined, finding that injection with prednisolone (with anaesthetic +/- tibial block) was significantly more effective than injection with anaesthetic alone at one month but not three months post-treatment. The authors concluded that steroid injections are effective at providing short-term pain relief; however, it was recognised that the review was based on studies identified through a single database search and was unlikely to have engaged with the evidence base in a comprehensive way.

Study	QS	Conclusions	Level of Evidence
Tatli et al (2009)	LQ (-)	The single RCT examined demonstrated significant improvement in pain with steroid injection at one month, but not at 3 months following treatment.	1-

Lafuente Guijosa et al., (2007)

In a low-quality systematic review by Lafuente Guijosa et al. (Lafuente Guijosa et al., 2007), one RCT by Crawford et al. (Crawford et al., 1999) was identified comparing steroid injection to placebo. The authors concluded that steroid injection was effective in reducing heel pain, but only on the short-term and to a limited extent.

Poor review reporting meant that it was difficult to determine the level of rigour applied to the review process and the characteristics of included studies.

Study	QS	Conclusions	Level of Evidence
Lafuente Guijosa et al (2007)	LQ (-)	Steroid injections are useful in reducing heel pain, but only on the short-term and to a limited extent.	1-

Crawford et al., (2003)

As part of a broader Cochrane systematic review examining the effectiveness of interventions for treating plantar heel pain, Crawford et al. (2003) examined five RCTs (N = 292) comparing the effectiveness of steroid injection against placebo and alternative treatment options of heel pads and custom-made orthoses. In comparison to placebo, steroid injection was found to be no more effective or only effective at reducing heel pain in the short term.

Study	QS	Conclusions	Level of Evidence
Crawford et al (2003)	HQ (++)	• There is limited evidence for the effectiveness of local steroid therapy. • Steroid injections appear to be useful only in the short term and only to a small degree.	1

Steroid Injection versus Alternative Treatments

Tsikopouls et al., (2016)

Tsikopouls et al. (2016) conducted a high quality systematic review/meta-analysis (MA) of RCTs (N = 140) comparing the effect of steroid injections versus autologous whole blood injection on heel pain in patients diagnosed with PF or epicondylopathy (this review considers only the former clinical population). The authors concluded that although steroid injection was marginally more effective (reaching statistical significance) at 2-6 weeks after treatment, there was no significant difference at 24-26 weeks after treatment. Caution was advised by the authors in interpreting these findings given the risk of bias associated with included studies, the inclusion of only three RCTs, and the clinical diversity observed within included studies.

Study	QS	Conclusions	Level of Evidence
Tsikopoulos et al (2016)	HQ (++)	In the short-term (2-6 weeks after treatment), steroid injections were marginally more effective in relieving pain that autologous whole blood injection. However, there was no significant difference at 24-26 weeks after treatment.	1

Ang et al., (2015)

Although considered to be of low-quality because of questions regarding the rigour of the review process, Ang et al. (Ang et al, 2015) provided a SR of 10 RCTs (N = 622) comparing steroid injection to various alternative treatments. All included studies demonstrated improvement in pain and/or plantar fascia thickness with steroid injection.

In comparison to other treatment modalities, corticosteroid injection was similar in effectiveness to physiotherapist-led exercise, more effective than use of silicone insoles, less effective than injection with botulinum toxin A, and more effective than injection with autologous blood. There was also no difference in effectiveness with ultrasound or palpation-guided approaches. The authors acknowledged that further study is required to provide conclusive evidence for the comparative effectiveness of these treatments.

Study	QS	Conclusions	Level of Evidence
Ang et al (2015)	LQ (-)	• In comparison to other treatment modalities, steroid injection was similar in effectiveness to physiotherapist-led exercise, more effective than use of silicone insoles, less effective than injection with botulinum toxin A, and more effective than injection with autologous blood. • There was no difference in effectiveness between ultrasound and palpation-guided injections or choice of steroid injection.	1-

Uden et al., (2011)

Uden et al. (Uden et al., 2011) provided a systematic review including two RCTs, one comparing steroid injection against electro hydraulic extracorporeal shock wave therapy and stretching exercises, and the other comparing steroid injection against autologous blood injection. Both studies reported significantly greater reductions in heel pain with steroid injection in the short term, although long-term effectiveness was similar for steroid injection and the alternative treatments.

Study	QS	Conclusions	Level of Evidence
Uden et al (2011)	HQ (++)	The two RCTs reviewed demonstrated short-term improvements in pain for corticosteroid injections versus treatments of electro hydraulic shock wave therapy or stretching exercises only or autologous blood injection	1-

Lafuente et al., (2007)

In a low-quality systematic review by Lafuente et al. (Lafuente et al., 2007), four RCTs (N = 273) were identified comparing steroid injection to orthotic devices/heel pads. The authors concluded that steroid injection was effective in reducing heel pain, but only on the short-term and to a limited extent.

Poor reporting meant that it was difficult to determine the level of rigour applied to the review process and the characteristics of included studies.

Study	QS	Conclusions	Level of Evidence
Lafuente et al (2007)	LQ (-)	Steroid injections are useful in reducing heel pain, but only on the short-term and to a limited extent.	1-

Crawford & Thomson (2003)

As part of a broader Cochrane systematic review examining the effectiveness of interventions for treating plantar heel pain, Crawford & Thomson (2003). The authors examined five RCTs (N = 292) comparing the effectiveness of steroid injection against placebo and conservative treatment options of heel pads and custom-made orthoses. The relative effectiveness of steroid injections compared to heel pads and orthoses was considered to be unclear.

Study	QS	Conclusions	Level of Evidence
Crawford et al (2003)	HQ (++)	• There is limited evidence for the effectiveness of local corticosteroid therapy. • Steroid injections appear to be useful only in the short term and only to a small degree.	1

Crawford et al., (2002)

An earlier systematic review by Crawford et al. (Crawford et al., 2002) examined three RCTs (N = 116), and similar to the later review (Crawford & Thomson, 2003) found conflicting results regarding the effectiveness of steroid injection compared to insole or heel pads in reducing heel pain. The authors concluded that there was limited evidence available to determine the true effectiveness of steroid injection compared with placebo or in comparison to alternative treatments and that high quality randomised studies were required.

Study	QS	Conclusions	Level of Evidence
Crawford et al (2002)	HQ (++)	• Conflicting results, with one study found significant improvements in pain with steroid injection compared to insole and another found no difference between steroid injections compared to heel pads. • The effectiveness of steroid injection has not been demonstrated against placebo treatment. • In all trials, improvement in heel pain was noted in both treated and non-treated groups.	1-

Atkins et al., (1999)

In a review of 3 RCTs (N = 116) by Atkins et al. (Atkins et al., 1999), one included study found improvements in pain outcome for steroid inject alone, compared with steroid and insole intervention, whereas two other studies found no benefit of steroid injection compared to heel pads or injection within saline. The authors were unable to produce robust evidence of effectiveness for steroid injection or alternative treatments for PF owing to the poor methodological quality of included studies.

Study	QS	Conclusions	Level of Evidence

Atkins et al (1999)	AQ (+)	Given overall poor methodological quality of studies, it is not possible to produce robust evidence of effectiveness of any treatment for plantar fasciitis.	1-

Randomised Controlled Trials

The following RCTs were not included in the previously reported SRs.

Steroid Injection versus Placebo

Mahindra et al., (2016)

Mahindra et al (Mahindra et al., 2016) compared palpation-guided injection of 40mg methylprednisolone (use of anaesthetic not reported) against placebo injection in 75 patients that had failed to respond to conservative therapy for three or more months. Steroid injection resulted in significant improvements over placebo in pain and heel function at three weeks and three months post-treatment.

Study	QS	Conclusions
Mahindra et al (2016)	HQ (++)	Local injection of steroid (or platelet rich plasma) is an effective treatment option for chronic plantar fasciitis up to 3 months

Al-Bluwi et al., (2011)

In a low-quality RCT, Al-Bluwi et al. (Al-Bluwi et al., 2011) compared the effectiveness of a specific orthotic device (EZStep), physiotherapy exercises, and palpation-guided steroid injection (type not specified) in improving pain in 198 patients with clinically diagnosed PF. All three treatment groups were also provided with NSAIDs as part of their treatment regime. Steroid injection was found to be significantly less effective than EZStep orthotic device at 24 weeks post-treatment, but more effective than physiotherapy. Although this study was not intended to study the role of steroid injection in PF; the authors noted that the steroid (and NSAID) group fared significantly better than physiotherapy (and NSAID) group.

Study	QS	Conclusions
Al-Bluwi et al (2011)	LQ (-)	Steroid injection (and NSAID) was found to be significantly less effective than EZStep orthotic device (and NSAID) at 24 weeks post-treatment, but more effective than physiotherapy (and NSAID).

Physical Therapies

Celik et al., (2016)

Celik et al (Celik et al., 2016) compared palpation-guided injection of 40mg methylprednisolone with anaesthetic to joint mobilisation and stretching exercises in 43 patients with chronic PF. Pain and functional outcomes improved at three, six, and 12 weeks follow-up for both groups, with significantly better results for steroid injection at all-time points. However, there were no significant differences between groups at one year for pain and functional outcomes. Therefore, injection with methylprednisolone was shown to be more effective in the short term

at improving pain and function compared to joint mobilisation and stretching, although neither was more effective at one year following treatment.

Study	QS	Conclusions
Celik et al (2016)	HQ (++)	• While both groups achieved significant improvements at the three, six, and 12 week follow-ups, the steroid injection group demonstrated better outcomes at all three time points. • Improvements in pain and functional outcomes were sustained for the joint mobilisation and stretching group for a period of time ranging from 12 weeks to 1 year, but not for the steroid injections.

Non-Steroidal Anti-inflammatory Drugs (NSAIDs)

Biswas et al., (2011)

One low-quality RCT (Biswas et al., 2011) examined the effectiveness of palpation-guided 40mg methylprednisolone with anaesthetic versus NSAID in the first-line treatment of 120 patients with recent-onset (< 3 months) PF. Pain was significantly lower for the steroid injection group at all-time points (one, two, four, and eight weeks post-treatment) compared with NSAID and the recurrence of heel pain was significantly lower in the steroid group (6/60 patients for steroid injection vs 33/60 patients for NSAID). Thus it was concluded that local injection of steroid is more effective in the first-line treatment of PF than oral NSAIDs.

Study	QS	Conclusions
Biswas et al (2011)	LQ (-)	Local injection of steroid is more effective in the treatment of plantar fasciitis than oral NSAIDs.

Extracorporeal Shock Wave Therapy (ESWT)

Eslamian et al., (2016)

Eslamian et al (Eslamian et al., 2016) compared palpation-guided injection of 40mg methylprednisolone with anaesthetic to radial ESWT in 40 patients non-responsive to conservative treatment of PF for two or more months. At one and two months after treatment, pain and foot function improved significantly for both groups, with no significant between group differences, and no significant difference in satisfaction with pain relief between groups.

Study	QS	Conclusions
Eslamian et al (2016)	HQ (++)	Both steroid injection and ESWT resulted in improvement in pain and functional ability two months after treatment, with neither being significantly more effective than the other. Although inter-group differences were not significant, foot function was improved more with ESWT and patients were more satisfied with ESWT, thus shockwave therapy seems a safe alternative for management of chronic plantar fasciitis

Mardani-Kivi et al., (2015)

Mardani-Kivi et al. (Mardani-Kivi et al., 2015) compared palpation-guided injection of 40mg methylprednisolone to EWST, this time in 84 patients with acute (pain lasting less than 6 weeks) PF. Pain intensity significantly improved in both groups compared to baseline at all-time points (three, six, and 12 weeks), with significantly greater improvement in favour of steroid injection. Treatment failure was observed in 14.7% of cases for steroid injection and 55.9% of cases for ESWT. These findings led the authors to conclude that steroid injection is more effective than ESWT in the initial treatment of PF.

Study	QS	Conclusions
Mardani-Kivi et al.2015	AQ (+)	Both ESWT and steroid injection can be used as initial treatment options for treating patients with acute plantar fasciitis; however, steroid injection is more effective

Steroid Injection versus alternative treatments (Invasive)

Platelet Rich Plasma Injection

Mahindra et al., (2016)

Mahindra et al (Mahindra et al., 2016) compared palpation-guided injection of 40mg methylprednisolone (use of anaesthetic not reported) against platelet rich plasma injection or placebo injection in 75 patients that had failed to respond to conservative therapy for three or more months. There were significant improvements in pain and heel function score at three weeks and three months for both treatment groups, but not for placebo. There were no significant differences between platelet rich plasma injection and steroid injection, with the exception of significantly better heel function in the platelet rich plasma group at three months. This led to the author's concluding that platelet rich plasma injection is as effective, if not more effective, than corticosteroid injection in treating chronic PF.

Study	QS	Conclusions
Mahindra et al (2016)	HQ (++)	• Local injection of platelet rich plasma or steroid is an effective treatment option for chronic plantar fasciitis. • Platelet-rich plasma injection is as effective if not more effective than steroid injection in treating chronic plantar fasciitis

Jain et al., (2015)

A low-quality study by Jain et al. (Jain et al., 2015) compared palpation-guided injection of 40mg triamcinolone with anaesthetic to PRP in 60 patients with plantar heel pain lasting greater than 12 months. At three months post-injection, both steroid and PRP groups demonstrated significant improvements across all outcomes related to heel pain and foot function, with no significant between-group differences. At six months there was no significant difference between groups for any outcome. At 12 months, all outcomes were significantly

better for PRP than for steroid injection, with the authors concluding that PRP has a better and more durable effect than steroid injection.

Study	QS	Conclusions
Jain et al (2015)	LQ (-)	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 steroid, its effect does not wear off with time. At 12 months, PRP is significantly more effective than steroid.

Monto (2014); Tiwari & Bhargava (2013)

Two other low-quality studies (Monto, 2014; Tiwari & Bhargava, 2013) also examined the effectiveness of PRP injection, comparing this to injection of 40mg methyl prednisone with anaesthetic under US (Monto, 2014) or radiographic (Tiwari & Bhargava, 2013) guidance. In their group of 40 patients that were non-responsive to conservative therapy, Monto (Monto, 2014) reported that PRP injection resulted in significantly greater improvement in foot pain and function compared with steroid injection at three, six, 12, and 24 months. In their group of 60 patients with a clinical diagnosis of PF (with various exposures to previous conservative treatments), Tiwari and Bhargava (Tiwari & Bhargava, 2013) found that PRP resulted in significantly greater pain reduction than steroid injection at one, three, and six months. Thus both authors concluded that PRP was more effective than steroid injection in the treatment of PF.

Study	QS	Conclusions
Monto (2014)	LQ (-)	PRP injection was more effective and durable than steroid injection for the treatment of chronic recalcitrant cases of PF

Study	QS	Conclusions
Tiwari and Bhargava (2013)	LQ (-)	PRP injection is more effective than steroid injection at relieving pain from PF

Autologous Blood Injection (ABI)

Yesiltas et al., (2015)

One low-quality RCT by Yesiltas et al. (Yesiltas et al., 2015) compared ABI with US-guided injection with triamcinolone in 60 patients with a diagnosis of PF. Both treatment groups resulted in significant improvements in pain at six weeks, three months, and six months, with no significant between group differences. Using US imaging, steroid injection was found to be significantly more effective at reducing heel pad thickness and diameter of the inflammation site than ABI.

Study	QS	Conclusions
Yesiltas et al (2015)	LQ (-)	Intralesional steroid injection and autologous venous blood injection have comparable effectiveness in the treatment of pain with PF, although

		steroid injection was more effective at improving heel pad thickness and the diameter of the site of inflammation.

Cryopreserved Human Amniotic Membrane Injection (c-hAM)

Hanselman et al., (2015)

A low-quality pilot RCT by Hanselman et al. (Hanselman et al., 2015) compared palpation-guided injection with 40mg methylprednisolone with anaesthetic to injection with c-hAM in 24 patients with a clinical diagnosis of PF. In the group receiving a single steroid injection, shoe fit at six weeks and general health at six weeks were statistically greater in the steroid group. In the group receiving two consecutive steroid injections (due to an inadequate response to the first injection), foot pain score at 12 weeks post-treatment was statistically greater in the c-hAM group. There was no significant difference in other variables related to heel pain or foot function at six or 12 weeks post-treatment. This led to the authors concluding that c-hAM was comparable in effectiveness to steroid injection, although further research was required to confirm the results of this pilot.

Study	QS	Conclusions
Hanselman et al (2015)	LQ (-)	Cryopreserved human amniotic membrane injection may be safe and comparable to steroid injection for treatment of PF. This is a pilot study and requires further investigation

Miniscalpel Needle Release Treatment

Li et al., (2014)

Li et al (Li et al., 2014) compared palpation-guided injection of 20mg triamcinolone with anaesthetic to miniscalpel-needle release treatment in 61 patients that had failed to respond to at least six months of conservative treatment for PF. All measures of pain (rising in morning, with activity, and overall rating) significantly improved at one, six, and 12 months for miniscalpel-needle release treatment, whereas steroid injection resulted in improvements in pain at one month, but not at six or 12 months. Miniscalpel-needle release treatment was significantly more effective than steroid injection at reducing pain at all study time points (one, six, and 12 months post-treatment).

Study	QS	Conclusions
Li et al (2014)	HQ (++)	Miniscalpel-Needle release treatment is safe and more effective than steroid injection in treating chronic plantar fasciitis

Radiation Therapy

Canyilmaz et al., (2015)

Radiation therapy (low-dose ionising radiation) was compared with palpation-guided injection of 40mg methylprednisolone in one low-quality RCT by Canyilmaz et al. (Canyilmaz et al., 2015), involving 128 patients with a clinical diagnosis of painful heel spur with pain lasting six months or more. Compared to steroid injection, radiotherapy resulted in significantly greater improvements in heel pain and foot function at three and six months after treatment.

Study	QS	Conclusions
Canyilmaz et al (2015)	LQ (-)	Radiation therapy is more effective at relieving pain than palpation-guided steroid injection for painful heel spur

Effectiveness by Injectate, Guidance Method, and Injection Technique

Comparison of Steroid Type

Ahmed et al., (2013)

One low-quality RCT by Ahmed et al. (Ahmed et al., 2013) found that palpation-guided injection with 40mg of methylprednisolone resulted in significantly greater improvements in heel pain at four, eight, and 12 weeks post-injection compared to injection with dexamethasone. Injections were performed in 60 patients with heel pain, secondary to PF, lasting 12 or more weeks with an unsatisfactory response to conservative treatments.

Study	QS	Conclusions
Ahmed et al (2013)	LQ (-)	Local methylprednisolone injection is superior to local dexamethasone injection in providing short term pain relief to the patients with PF.

Comparison of Injectate with or without Anaesthetic

No study included within this review examined the relative efficacy of steroid injection with or without anaesthetic.

Ultrasound versus Palpation-Guided Steroid Injection

Saba & El-Sherif (2016)

A low-quality RCT by Saba and El-Sherif (Saba & El-Sherif, 2016) compared US versus palpation-guided injection of triamcinolone with anaesthetic on pain, disability, plantar fascia thickness and echogenicity in 21 (all female) patients that were non-responsive to at least 3 months of conservative therapies. Significant improvements for all outcomes were observed in both groups, with no between group differences at either two or four weeks post-injection.

Study	QS	Conclusions
Saba and El-Sherif (2016)	LQ (-)	Ultrasound-guided and palpation-guided local corticosteroid injections were effective and successful in treatment of PF. Both techniques improved PF clinically and ultrasonographically without statistically significant superior results for the ultrasound-guided injection

Chen et al., (2013)

Chen et al. (Chen et al., 2013) compared the effectiveness of US (using a custom injection guidance device) versus palpation-guidance of betamethasone into the heels of 33 patients that had failed to respond to conservative therapies.

Although both US and palpation-guided steroid injection resulted in significant improvements in heel pain, tenderness threshold, and thickness of the plantar fascia, the device-assisted US-guided group demonstrated significantly improved tenderness threshold and pain score compared to the palpation-guided group. Although the authors concluded that device-assisted US-guided injection was superior to palpation-guidance, it is unclear whether US-guidance, the use of an assistive device, or both was responsible for the reported therapeutic benefit.

Study	QS	Conclusions
Chen et al (2013)	LQ (-)	Device-assisted ultrasound-guided injection for treating plantar fasciitis results in better therapeutic outcomes than palpation-guided injection

Tsai et al., (2006)

Contrasting findings were presented by a low-quality RCT by Tsai et al. (Tsai et al., 2006), comparing the effectiveness of US and palpation-guided injection with betamethasone in 25 patients that were non-responsive to conservative treatment for two or more months. Between group analyses favoured US-guidance for improving tenderness threshold at two weeks, two months, and one year, for improving pain at one year, and reducing PF thickness at one year. Recurrence of heel pain was also significantly lower in the US-guided group, leading to the conclusion that US-guidance of steroid injection leads to better patient outcomes than guidance by palpation.

Study	QS	Conclusions
Tsai et al (2006)	LQ (-)	Steroid injection can be an effective way to treat PF, and injection under sonographic guidance is associated with lower recurrence of heel pain

Treatment with Steroid Injection for Acute versus Chronic Plantar Fasciitis

All the high quality RCTs examined the effect of steroid injection in cases of chronic plantar fasciitis (from a minimum of two months to a minimum of 6 months plantar heel pain). Three studies examined patients that had failed to respond to conservative therapies (Eslamian 2016, Li et al 2014, Mahindra 2016) and one study did not report on exposure to prior treatments (Celik et al 2016).

Biswas et al., (2011); Mardani-Kivi et al., (2015)

Only two RCTs examined the use of steroid injection as a first-line treatment for acute PF. One adequate-quality RCT by Mardani-Kivi et al. (Mardani-Kivi et al., 2015) found that steroid

injection (40mg methylprednisolone with anaesthetic) and ESWT were both effective in the initial treatment of acute PF, although steroid injection was found to be significantly more effective. A low-quality RCT by Biswas et al. (Biswas et al., 2011) found that steroid injection (40mg methylprednisolone with anaesthetic) resulted in significant improvements in heel pain over NSAID when used as a first-line treatment for PF. The recurrence of heel pain was significantly lower in the steroid group (6/60 patients vs 33/60 patients for NSAID), suggesting a role for steroid injection over oral NSAIDs in the first-line treatment of acute PF.

Study	QS	Conclusions
Mardani-Kivi et al.2015	AQ (+)	Both ESWT and steroid injection can be used as initial treatment options for treating patients with acute plantar fasciitis; however, steroid injection is more effective

Study	QS	Conclusions
Biswas et al (2011)	LQ (-)	Local injection of steroid is more effective in the treatment of plantar fasciitis than oral NSAIDs.

3.5 Outcome Measures – Safety and Risk

Systematic Reviews

No high quality SR identified any adverse event other than transient pain at the injection site (Crawford 2002, Crawford 2003, Tsikopoulos et al 2016, Uden et al 2011), although it was acknowledged that adverse events were not universally reported in included studies. Three of the included srs (Atkins et al., 1999; Lafuente Guijosa et al., 2007; Tatli & Kapasi, 2009) did not report on adverse events.

Randomised Controlled Trials

Four of the nine high quality RCTs that reported on the incidence of adverse events observed no adverse events with steroid injection (Celik et al., 2016; Eslamian et al., 2016; Li et al., 2014; Mahindra et al., 2016). One of the adequate-quality RCTs, did not include adverse events in their reporting (Mardani-Kivi et al., 2015).

Of the low-quality RCTs, one reported localised pain and swelling after injection, resolving within 48 hours following injection (Ahmed et al., 2013). Another reported six cases of injection site erythema, two cases of injection site infection, and two cases of plantar fascia rupture in a group of 60 patients treated with palpation-guided injection of 40mg methylprednisolone (Biswas et al., 2011). Another study reported one case of injection site infection among 64 patients treated with palpation-guided injection of methylprednisolone (Canyilmaz et al., 2015).

No adverse events were reported in studies comparing ultrasound and palpation-guided injection with steroid (Chen et al., 2013; Saba & El-Sherif, 2016; Tsai et al., 2006; Yucel et al., 2009).

Observational Studies

One adequate quality case-control study was identified (Lee et al., 2014), which examined the risk factors for plantar fascia rupture in 286 patients previously treated for PF. Of the assessed risk factors, only steroid injection was found to be associated with plantar fascia rupture, with an odds ratio of 32.96 (95%CI: 9.724 to 111.717). Thus it was concluded that steroids should

	be used cautiously because of the risk of plantar fascia rupture. No details were provided regarding the injectate, injection technique, or guidance method used in this patient group.
3.6 Economic analysis	No systematic review, experimental study, or observational study identified within this search provided an economic analysis of steroid injection in the treatment of plantar fasciitis.

4. Recommendations

Grade of Recommendations

Evidence of Effectiveness against Placebo

- Steroid injection to the plantar fascia appear to be effective at reducing pain in the short-term (<3months post-treatment) when compared to placebo, but fails to offer any significant benefit in the long-term (Grade of Recommendation: A, based on one HQ SR, one HQ RCT, one AQ SR, and two LQ SRs)

Evidence of Effectiveness compared with Conservative (non-invasive) Treatments

- Steroid injection to the plantar fascia is likely to be more effective at reducing pain in the short-term (<3months post-treatment) compared with physical therapies; however, has comparable effectiveness in the long-term (Grade of Recommendation: B, based on one HQ SR and one HQ RCT)
- Steroid injection is more effective than use of silicone insoles at reducing pain in the short-term (<3 months post-treatment), with inconsistent results for relative long-term effectiveness (Grade of Recommendation B: based on one HQ RCT)
- Steroid injection comparable to extracorporeal shockwave therapy in reducing pain in the long-term (≥3 months post-treatment), with inconsistent results regarding short-term effectiveness (Grade of Recommendation: B, based on one HQ SR, one HQ RCT, and one AQ RCT)

Evidence of Effectiveness compared with Alternative (invasive) Treatments

- Steroid injection is superior to autologous blood injection at reducing pain in the short-term (<3months post-treatment); however, has comparable effectiveness in the long-term (Grade of Recommendation: B, based on two HQ SRs, one LQ SR, and one LQ RCTs)
- Steroid injection is inferior to injection with botulinum toxin type A at reducing pain in the short and long-term (Grade of Recommendation B: based on one HQ RCT)
- Steroid injection is inferior to miniscalpel-needle release treatment at reducing pain in the short and long-term (Grade of Recommendation B: based on one HQ RCT)

Evidence of Effectiveness by Guidance Method

- There is no difference in pain outcome for steroid injections delivered with ultrasound or palpitation guidance (Grade of Recommendation B: based on one HQ RCT)

Evidence of Adverse Events with Steroid Injection

- Steroid injection is associated with increased risk of rupture of the plantar fascia (Grade of Recommendation: D, based on one AQ case-control study)

Insufficient Body of Evidence

- Although the body of low-quality RCTs suggest that steroid injection is inferior to platelet rich plasma injections at reducing pain in the short and long-term, as no high quality studies currently exist.
- Only one low-quality RCT compared the effectiveness of steroid injection to radiation therapy.

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6. Appendices

Appendix 1: Search string used in Medline

Database: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R) <1946 to Present>

Search Strategy:

1 Betamethasone/
2 Dexamethasone/
3 Fluocortolone/
4 Methylprednisolone/
5 Paramethasone/
6 Prednisolone/
7 Prednisone/
8 Triamcinolone/
9 Hydrocortisone/
10 Cortisone/
11 Methandrostenolone/
12 Stanozolol/
13 Methenolone/
14 Oxymetholone/
15 Oxandrolone/
16 Nandrolone/
17 exp Steroids/
18 steroid$1.ti,ab.
19 (betamethasone or dexamethasone or fluocortolone or methylprednisolone or paramethasone or prednisolone or prednisone or triamcinolone or hydrocortisone or cortisone or prednylidene or rimexolone or deflazacort or cloprednol or meprednisone or cortivazol).ti,ab.
20 (androstanolone or stanozolol or metandienone or metenolone or oxymetholone or quinbolone or prasterone or oxandrolone or norethandrolone).ti,ab.
21 (nandrolone or ethylestrenol or oxabolone cipionate).ti,ab.
22 (Diflucortolone or Fluprednisolone or Methylprednisolone or Prednimustine or Methandrostenolone).ti,ab.
23 or/1-22
24 Injections/
25 injection*.ti,ab.
26 or/24-25
27 exp Pain/
28 pain.ti,ab.
29 or/27-28
30 Heel/
31 Fasciitis, Plantar/
32 Fasciitis/
33 (heel or plantar fasciitis or heel spur or plantar aponeurosis).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]
34 or/30-33
35 and/23,26,29,34

Appendix 2: Critical appraisal tools used within this review

SIGN Critical Appraisal Tool for systematic reviews and Meta-analyses

SIGN

Methodology Checklist 1: systematic reviews and Meta-analyses

SIGN gratefully acknowledges the permission received from the authors of the AMSTAR tool to base this checklist on their work: *Shea BJ, Grimshaw JM, Wells GA, Boers M, Andersson N, Hamel C,. et al. Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. BMC Medical Research Methodology 2007, **7**:10 doi:10.1186/1471-2288-7-10. Available from http://www.biomedcentral.com/1471-2288/7/10 [cited 10 Sep 2012]*

Study identification (*Include author, title, year of publication, journal title, pages*)	
Guideline topic:	Key Question No:
Before completing this checklist, consider: Is the paper relevant to key question? Analyse using PICO (Patient or Population Intervention Comparison Outcome). IF NO reject. IF YES complete the checklist.	
Checklist completed by:	

Section 1: Internal validity

In a well conducted systematic review:		***Does this study do it?***	
1.1	The research question is clearly defined and the inclusion/ exclusion criteria must be listed in the paper.	Yes □ **If no reject**	No □
1.2	A comprehensive literature search is carried out.	Yes □ Not applicable □ **If no reject**	No □
1.3	At least two people should have selected studies.	Yes □	No □ Can't say □
1.4	At least two people should have extracted data.	Yes □	No □ Can't say □
1.5	The status of publication was not used as an inclusion criterion.	Yes □	No □
1.6	The excluded studies are listed.	Yes □	No □
1.7	The relevant characteristics of the included studies are provided.	Yes □	No □
1.8	The scientific quality of the included studies was assessed and reported.	Yes □	No □
1.9	Was the scientific quality of the included studies used appropriately?	Yes □	No □

1.10	Appropriate methods are used to combine the individual study findings.	Yes □ Can't say □	No □ Not applicable □
1.11	The likelihood of publication bias was assessed appropriately.	Yes □ Not applicable □	No □
1.12	Conflicts of interest are declared.	Yes □	No □
SECTION 2: OVERALL ASSESSMENT OF THE STUDY			
2.1	What is your overall assessment of the methodological quality of this review?	High quality (++) □ Acceptable (+) □ Low quality (-)□ Unacceptable – reject 0 □	
2.2	Are the results of this study directly applicable to the patient group targeted by this guideline?	Yes □	No □
2.3	**Notes:**		

SIGN Critical Appraisal Tool for Controlled trials

Methodology Checklist 2: Controlled Trials

Study identification (*Include author, title, year of publication, journal title, pages*)

Guideline topic:	Key Question No:	Reviewer:

Before completing this checklist, consider:

1. Is the paper a **randomised controlled trial** or a **controlled clinical trial**? If in doubt, check the study design algorithm available from SIGN and make sure you have the correct checklist. If it is a **controlled clinical trial** questions 1.2, 1.3, and 1.4 are not relevant, and the study cannot be rated higher than 1+
2. Is the paper relevant to key question? Analyse using PICO (Patient or Population Intervention Comparison Outcome). IF NO REJECT (give reason below). IF YES complete the checklist.

Reason for rejection: 1. Paper not relevant to key question ☐ 2. Other reason ☐ (please specify):

SECTION 1: INTERNAL VALIDITY

In a well conducted RCT study…		***Does this study do it?***
1.1	The study addresses an appropriate and clearly focused question.	Yes ☐ No ☐ Can't say ☐
1.2	The assignment of subjects to treatment groups is randomised.	Yes ☐ No ☐ Can't say ☐
1.3	An adequate concealment method is used.	Yes ☐ No ☐ Can't say ☐
1.4	The design keeps subjects and investigators 'blind' about treatment allocation.	Yes ☐ No ☐ Can't say ☐
1.5	The treatment and control groups are similar at the start of the trial.	Yes ☐ No ☐ Can't say ☐
1.6	The only difference between groups is the treatment under investigation.	Yes ☐ No ☐ Can't say ☐
1.7	All relevant outcomes are measured in a standard, valid and reliable way.	Yes ☐ No ☐ Can't say ☐
1.8	What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?	
1.9	All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).	Yes ☐ No ☐ Can't say ☐ Does not apply ☐

1.10	Where the study is carried out at more than one site, results are comparable for all sites.	Yes ☐ No ☐ Can't say ☐ Does not apply ☐

SECTION 2: OVERALL ASSESSMENT OF THE STUDY		
2.1	How well was the study done to minimise bias? *Code as follows:*	High quality (++)☐ Acceptable (+)☐ Low quality (-)☐ Unacceptable – reject 0 ☐
2.2	Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention?	
2.3	Are the results of this study directly applicable to the patient group targeted by this guideline?	
2.4	**Notes.** Summarise the authors' conclusions. Add any comments on your own assessment of the study, and the extent to which it answers your question and mention any areas of uncertainty raised above.	

SIGN Critical Appraisal Tool for case-control studies

SIGN	**Methodology Checklist 3: case-control studies**

Study identification (*Include author, title, year of publication, journal title, pages*)

Guideline topic:	Key Question No:	Reviewer:

Before completing this checklist, consider:

1. Is the paper really a case-control study? If in doubt, check the study design algorithm available from SIGN and make sure you have the correct checklist.
2. Is the paper relevant to key question? Analyse using PICO (Patient or Population Intervention Comparison Outcome). IF NO REJECT (give reason below). IF YES complete the checklist..

Reason for rejection: 1. Paper not relevant to key question ☐ 2. Other reason ☐ (please specify):

Please note that a retrospective study (ie a database or chart study) cannot be rated higher than + .

Section 1: Internal validity

In a well conducted cohort study:		Does this study do it?	
1.1	The study addresses an appropriate and clearly focused question.	Yes □ Can't say □	No □
SELECTION OF SUBJECTS			
1.2	The cases and controls are taken from comparable populations.	Yes □ Can't say □	No □ Does not apply □
1.3	The same exclusion criteria are used for both cases and controls.	Yes □	No □ Does not apply □
1.4	What percentage of each group (cases and controls) participated in the study?	Yes □ Can't say □	No □ Does not apply □
1.5	Comparison is made between participants and non-participants to establish their similarities or differences.	Yes □ Can't say □	No □ Does not apply □
1.6	Cases are clearly defined and differentiated from controls.	Yes □ Can't say □	No □ Does not apply □
1.7	The outcomes are clearly defined.	Yes □ Can't say □	No □

ASSESSMENT			
1.8	Measures will have been taken to prevent knowledge of primary exposure influencing case ascertainment.	Yes □ Can't say □	No □ Does not apply □
1.9	Exposure status is measured in a standard, valid and reliable way	Yes □ Can't say □	No □ □
CONFOUNDING			
1.10	The main potential confounders are identified and taken into account in the design and analysis.	Yes □ Can't say □	No □
STATISTICAL ANALYSIS			
1.14	Confidence intervals are provided	Yes □	No □
SECTION 2: OVERALL ASSESSMENT OF THE STUDY			
2.1	How well was the study done to minimise the risk of bias or confounding?	High quality (++) □ Acceptable (+) □ Unacceptable – reject 0	
2.2	Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, do you think there is clear evidence of an association between exposure and outcome?	Yes ☐ Can't say ☐	No ☐
2.3	Are the results of this study directly applicable to the patient group targeted in this guideline?	Yes □	No □
2.4	**Notes.** Summarise the authors conclusions. Add any comments on your own assessment of the study, and the extent to which it answers your question and mention any areas of uncertainty raised above.		

Appendix 3: Quality scores for articles used in this review (systematic reviews)

Reference (author, year)		Quest												
Study	**Year**	**1.1**	**1.2**	**1.3**	**1.4**	**1.5**	**1.6**	**1.7**	**1.8**	**1.9**	**1.10**	**1.11**	**1.12**	**2.1**
Ang	2015	Y	Y	CS	CS	N	N	Y	Y	Y	NA	N	N	LQ (-)
Atkins et al	1999	Y	Y	CS	Y	Y	N	Y	Y	Y	NA	N	Y	AQ (+)
Crawford et al	2002	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	N	Y	HQ (++)
Crawford et al	2003	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	N	Y	HQ (++)
Lafuente et al	2007	Y	Y	CS	CS	N	N	N	N	N	NA	N	N	LQ (-)
Li et al	2015	Y	Y	Y	CS	N	N	Y	Y	Y	Y	N	N	AQ (+)
Tatli et al	2009	Y	N	CS	CS	N	N	N	N	N	NA	N	N	LQ (-)
Tsikopoulos et al	2016	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y	HQ (++)
Uden et al	2011	Y	Y	Y	Y	N	Y	-	Y	Y	NA	N	Y	HQ (++)

Appendix 4: RCTs included in SRs

	Systematic Reviews										
	Atkins et al., 1999	Crawford et al. 2002	Li et al 2015	Tatli et al 2009	Lafuente et al., 2007	Crawford et al. 2003	Tsikopoulos et al., 2016	Ang et al, 2015	Uden et al., 2011	Lafuente et al., 2007	**Total**
RCTs											
Crawford 1999			1	1	1	1		1		1	6
McMillan et al 2012			1					1			2
Abdihakin 2012			1								1
Ball et al 2013			1					1			2
Black et al 1996	1	1				1				1	4
Blockey 1956	1					1					2
Kriss 1990	1	1				1				1	4
Lynch et al 1998						1				1	2
Lee et al 2007							1	1			2
Kiter et al 2006							1	1			2
Kalaci 2009							1				1
Ryan et al 2014								1			1
Guner et al 2013								1			1
Yucel et al 2013								1			1
Elizondo-Rodriguez et al 2013								1			1
Diaz-Liopis et al 2012								1			1
Porter and Shadbolt 2005									1		1
Lee and Ahmad 2007									1		1
Total	3	2	4	1	1	5	3	10	2	4	

Appendix 5: Quality scores for articles used in this review (RCTs)

Reference (author, year)		Quest												
Study	**Year**	**1.1**	**1.2**	**1.3**	**1.4**	**1.5**	**1.6**	**1.7**	**1.8**	**1.9**	**1.10**	**2.1**	**2.2**	**2.3**
Ahmed et al	2013	Y	CS	N	N	Y	Y	Y	0%	NA	NA	LQ (-)	N	Y
2.4	Local methylprednisolone injection is superior to local dexamethasone injection, in providing short term pain relief to the patients with planter fasciitis.													
Al-Bluwi et al	2011	Y	CS	N	CS	N	CS	Y	0.5%	CS	NA	LQ (-)	N	N
2.4	For both pain VAS and SFMPQ, steroid injection was significantly less effective than EZStep orthotic device but more effective than physiotherapy													
Biswas et al	2011	Y	N	N	CS	Y	N	N	CS	CS	NA	LQ (-)	N	Y
2.4	Local injection of steroid is more effective in the treatment of plantar fasciitis than oral NSAIDs													
Canyilmaz et al	2015	Y	N	N	N	N	N	Y	3.1%	Y	NA	LQ (-)	N	Y
2.4	Radiation therapy is more effective at relieving pain than palpation-guided steroid injection for plantar fasciitis													
Celik et al	2016	Y	Y	Y	Y	Y	N	Y	9.3%	Y	NA	HQ (++)	Y	Y
2.4	While both groups achieved significant improvements at the 3, 6, and 12 week follow-ups, the steroid injection group demonstrated better outcomes at all 3 time points. Improvements were sustained for the joint mobilisation and stretching group for a period of time ranging from 12 weeks to 1 year, but not for the steroid injections.													
Chen et al	2013	Y	CS	CS	CS	Y	Y	Y	3.0%	CS	NA	LQ (-)	N	Y
2.4	Device-assisted ultrasound-guided injection for treating plantar fasciitis results in better therapeutic outcomes than palpation-guided injection													
Eslamian et al	2016	Y	Y	CS	Y	Y	Y	Y	0%	Y	NA	HQ (++)	Y	Y
2.4	Both interventions caused improvement in pain and functional ability 2 months after treatment. Although inter-group differences were not significant, foot function was improved more with ESWT and patients were more satisfied with ESWT, thus shockwave therapy seems a safe alternative for management of chronic plantar fasciitis													
Hanselman et al	2015	Y	CS	N	Y	CS	Y	Y	4.2%	N	NA	LQ (-)	N	Y
2.4	Cryopreserved human amniotic membrane injection may be safe and comparable to corticosteroid injection for treatment of PF. This is a pilot study and requires further investigation													
Jain et al	2015	Y	CS	N	N	Y	Y	Y	CS	CS	NA	LQ (-)	N	Y
2.4	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 steroid, its effect does not wear off with time. At 12 months, PRP is significantly more effective than steroid, making it better and more durable than cortisone injection													
Li et al	2014	Y	Y	Y	CS	Y	Y	Y	11.5%	Y	NA	HQ (++)	Y	Y
2.4	Miniscalpel-Needle treatment is safe and more effective than steroid injection in treating PF													
Mahindra et al	2016	Y	Y	Y	Y	Y	Y	Y	CS	Y	NA	HQ (++)	Y	Y
2.4	Local injection of platelet-rich plasma or corticosteroid is an effective treatment option for chronic PF. Platelet-rich plasma injection is as effective as corticosteroid injection in treating chronic PF													
Mardani-Kivi	2015	Y	Y	CS	Y	Y	Y	Y	19.0%	N	NA	AQ (+)	Y	Y
2.4	Both ESWT and steroid injection can be used as initial treatment options for treating patients with acute plantar fasciitis; however, steroid injection is more effective													
McMillan et al	2012	Y	Y	Y	Y	Y	Y	Y	1.2%	Y	NA	HQ (++)	Y	Y
2.4	A single ultrasound guided dexamethasone injection is a safe and effective short term treatment for PF. It provides greater pain relief than placebo at four weeks and reduces abnormal swelling of the PF for up to three months; however, significant pain relief did not continue beyond four weeks													
Monto	2014	Y	CS	N	Y	N	Y	Y	CS	CS	NA	LQ (-)	N	Y

Reference (author, year)		Quest												
Study	**Year**	**1.1**	**1.2**	**1.3**	**1.4**	**1.5**	**1.6**	**1.7**	**1.8**	**1.9**	**1.10**	**2.1**	**2.2**	**2.3**
2.4	Platelet-rich plasma injection was more effective and durable than steroid injection for the treatment of chronic recalcitrant cases of PF													
Motififard et al	2008	Y	CS	N	N	CS	N	N	CS	CS	CS	Reject (0)	N	N
2.4	Corticosteroid injection together with casting was more effective at treating heel pain than use of heel pads													
Mulherin & Price	2009	Y	CS	N	CS	CS	CS	Y	CS	CS	NA	Reject (0)	N	N
2.4	Although there is a natural course of improvement with Plantar Heel Pain Syndrome, 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													
Narula et al	2014	Y	CS	N	N	CS	N	Y	27.5%	N	NA	Reject (0)	N	N
2.4	As both treatment modalities are comparative in treatment outcome, it is better to go for conservative approach because this can avoid the complications of steroid therapy													
Omar et al	2012	Y	CS	N	N	Y	Y	Y	CS	CS	NA	Reject (0)	N	N
2.4	PRP was more effective than steroid injection in relieving the short-term symptoms of PF													
Saba & El-Sherif	2015	Y	CS	N	N	Y	Y	Y	0%	Y	NA	LQ (-)	N	Y
2.4	Ultrasound-guided and palpation-guided local corticosteroid injections were effective and successful in treatment of PF. Both techniques improved PF clinically and ultrasonographically without statistically significant superior results for the ultrasound-guided injection													
Tiwari & Bhargava	2013	Y	CS	N	N	CS	Y	N	CS	CS	NA	Reject (0)	N	N
2.4	PRP injection is more effective than steroid injection at relieving pain from PF													
Tsai et al	2006	Y	CS	N	N	Y	Y	Y	0%	CS	NA	LQ (-)	N	Y
2.4	Steroid injection can be an effective way to treat PF, and injection under sonographic guidance is associated with lower recurrence of heel pain													
Yesiltas et al	2015	Y	Y	Y	N	N	Y	N	22.4%	CS	NA	LQ (-)	N	Y
2.4	Intralesional steroid injection and autologous venous blood injection have comparable effectiveness in the treatment of PF													
Yucel et al	2010	Y	CS	N	N	N	Y	Y	0%	CS	NA	LQ (-)	N	Y
2.4	Corticosteroid injection and ESWT are comparable in effectiveness in treating the symptoms of chronic PF													
Yucel et al	2009	Y	CS	N	N	N	Y	Y	CS	CS	NA	LQ (-)	N	Y
2.4	US-, palpation-, and scintigraphy-guidance were all effective in the treatment of plantar fasciitis, and there was no statistically significant difference between these techniques in terms of plantar fascia thickness, fat pad thickness, and pain rating													

Appendix 6: Quality scores for articles used in this review (case-control studies)

Reference (author, year)		Quest												
Study	**Year**	**1.1**	**1.2**	**1.3**	**1.4**	**1.5**	**1.6**	**1.7**	**1.8**	**1.9**	**1.10**	**2.1**	**2.2**	**2.3**
Lee et al	2014	Y	Y	CS	CS	Y	Y	Y	DNA	CS	Y	AQ (+)	Y	Y
2.4	Steroid injections for plantar fasciitis should be cautiously administered because of the higher risk for plantar fascia rupture													

Appendix 7: Extracted data from included systematic reviews

Author and year	SIGN Score	Approach	Studies (patient No)	Outcome	Conclusions	Evidence				Grade
						1	2	3	4	
Ang, 2015	LQ (-)	Various corticosteroids (dexamethasone, betamethasone, methylprednisolone, prednisolone, triamcinolone), approaches (medial, posterior, heel pad), and guidance (palpation and ultrasound)	10 RCTs; N = 622	Foot or heel pain, heel tenderness, plantar fascia thickness	• Two high-quality RCTs demonstrated strong evidence of effectiveness for heel pain and plantar fascia thickness, lasting for up to three months for patients that had failed two months of conservative treatment. • There was no difference in effectiveness between ultrasound and palpation-guided injections or choice of corticosteroid injection • In comparison to other treatment modalities, corticosteroid injection was similar in effectiveness to physiotherapist-led exercise, more effective than use of silicone insoles, less effective than injection with botulinum toxin A, and more effective than injection with autologous blood.	0	0	1	0	1-
Atkins et al, 1999	AQ (+)	Triamcinolone or hydrocortisone. Approach or method of guidance NS	3 RCTs; N = 116	Foot or heel pain, Foot Function Index, Maryland Foot Score, AOFAS Ankle-Hind Foot Rating, Ritchie Tenderness Scale	• One non-blinded trial (Kriss 1990) found improvements in pain outcome for steroid inject alone, compared with steroid and insole intervention, whereas two other studies found no benefit of steroid injection compared to heel pads (Black 1991) or injection within saline (Blockey 1956). • Given overall poor methodological quality of studies, it is not possible to produce robust evidence of effectiveness of any treatment for plantar fasciitis.	0	1	0	0	1-
Crawford et al, 2002	HQ (++)	Triamcinolone or hydrocortisone. Approach or method of guidance NS	3 RCTs; N = 116	Heel pain	• Conflicting results, with one study found significant improvements in pain with steroid injection compared to insole (Kriss 1990) and another found no difference between steroid injection compared to heel pads (Black 1996). • The effectiveness of steroid injection has not been demonstrated against placebo treatment, focusing on comparison to certain types of orthotic device. • In all trials, improvement in heel pain was noted in both treated and non-treated groups.	0	1	0	0	1-
Crawford et al, 2003	HQ (++)	Triamcinolone, hydrocortisone, or prednisolone. Approach or method of guidance NS	5 RCTs; N = 292	Heel pain	• There is limited evidence for the effectiveness of local corticosteroid therapy. • Steroid injections appear to be useful only in the short term and only to a small degree.	0	1	1	0	1

Lafuente et al, 2007	LQ (-)	Details not specified	4 RCTs; N = 273	Heel pain	• Steroid injections are useful in reducing heel pain, but only on the short-term and to a limited extent. • Because multiple steroid injections are associated with weakness, plantar fat atrophy, and plantar fascia rupture, steroid injections should be reserved for cases that are refractory to other therapies.	0	0	0	0	1-
Li et al, 2015	AQ (+)	Prednisolone, dexamethasone, or methylprednisolone. Approach or method of guidance NS	4 RCTs; N = 289	Heel pain and plantar fascial thickness after one, two, and three months	• Corticosteroids resulted in significant improvement in pain compared to placebo after one month (SMD=-0.32; 95%CI: -0.59 to -0.06; p=0.02); however there was no significant difference after two or three months. • No significant difference was found in plantar fascial thickness for those treated with corticosteroid or placebo.	1	1	0	0	1
Tatli et al, 2009	LQ (-)	Prednisolone. Approach or method of guidance NS	1 RCTs; N = 106	Heel pain	• The single RCT examined (Crawford et al. 1999) demonstrated significant improvement in pain with steroid injection at one month, but not at 3 months following treatment.	0	0	0	0	1-
Tsikopoulos et al, 2016	HQ (++)	Triamcinolone or methylprednisolone. Approach or method of guidance NS	3 RCTs; N = 140	Heel pain	• In the short-term (2-6 weeks after treatment), steroid injections were marginally more effective in relieving pain that autologous whole blood injection (SMD=0.55; 95%CI: 0.17 to 0.93; p=0.005). However, there was no significant difference at 24-26 weeks after treatment.	1	1	0	0	1
Uden et al, 2011	HQ (++)	Details not specified	2 RCTs; N = 189	Heel pain	• The two RCTs reviewed demonstrated short-term improvements in pain for corticosteroid injections versus treatments of electrocorporeal shock wave therapy or stretching exercises only (Porter & Shadbolt 2005) or autologous blood injection (Lee & Ahmad 2007). • Corticosteroid injections were consistently considered painful by patients.	0	1	0	0	1-

Appendix 8: Data extraction table used in this review (RCTs)

Population Characteristics	Previous	Not satisfied with treatment over non-responsive period	Not reported
	Duration	Pain in heel > 12 weeks	Mean (SD) = 12.33(7.4)wks for Ezstep, 11.1(7.6)wks for physio, 13.2(2.7)wks for
	Diagnost	Pain on palpation at the site of the medial calcaneal tubercle or proximal plantar fascia	Clinical symptoms, with alterior pathology excluded via clinical
	Diagnost	Plantar fasciitis	Plantar fasciitis
	Age	Mean (SD) = 48.3 (8.5)yrs	Mean (SD) = 45.16(5.1)yrs for Ezstep, 41.2(3.6)yrs for physio, 42.8(2.5)yrs for
	Sample	60	198
Imaging		Palpation-guided	Palpation-guided
Safety and Risk		Adverse events observed in 13.3% of patients (pain after injection for 5 in intervention group and 4 in comparator, and localised swelling for	Not reported
Conclusions		Local methylprednisolone injection is superior to local dexamethasone injection, in providing short term pain relief to the patients with planter fasciitis.	The present study was not intended to study the role of steroid injection in PF; however, while analyzing the data for comparing the study and control groups, we observed that the steroid and NSAID group fared significantly better than physiotherapy and NSAID group
Functional outcomes	OTHER	-	-
	Quality of Life	-	-
	RTW	-	-
	Disability	-	-
	ROM	-	-
Pain	Results	Both steroid injections resulted in improvements in pain over a period of 12 weeks (no tests of significance conduced). In comparison to dexamethasone, methylprednisolone resulted in significantly greater improvements in heel pain at 4, 8, and 12 weeks after injection.	For both pain VAS and SFMPQ, steroid injection was significantly less effective than EZStep orthotic device but more effective than physiotherapy.
	Outcome Assessment Time points	Baseline and 4, 8, and 12 weeks	Baseline and 24 weeks
	Outcome measures	Pain relief on first step, no tenderness on palpation at medial calcaneal tubercle (primary outcomes), persistant pain, and infection (secondary outcomes). VAS used for all pain measures	VAS for pain, Short-Form McGill Pain Questionnaire (SFMPQ)
Comparator		4mg dexamethasone	EZStep orthotic device + NSAIDs OR physiotherapy + NSAIDs
Approach		Medial side of area of tenderness in the proximal region of the plantar fascia	Not reported
+/- Local Anaesthetic		+	Not reported
Dose (mg)		40mg	Not reported
Steroid		Methylprednisolone	Not reported
Country		Pakistan	Saudi Arabia
Year		2013	2011
Author		Ahmed et al	Al-Bluwi et al

Failed to respond to at least 8 weeks of conservative therapy	No prior treatment	Not reported	Not reported
Median (range) = 6 (2.5-60) months	< 3 months pain	> 6 months	Mean (SD) = 13.1 (2.6)mo for steroid and 11.2 (3.2)mo for joint mobilisation
History of heel pain + point tenderness over the medial tubercle of the calcaneus	Not reported	Clinical diagnosis of painful heel spur	Tenderness over the medial tubercle of the calcaneus, pain with palpation of the proximal
Plantar fasciitis	Unilateral plantar fasciitis	Painful heel spur	Plantar fasciitis
Mean (SD) = 49 (11.3)yrs	Mean (SD) = 38.4 (11.6)yrs for NSAID and 41.7 (8.9)yrs for	Mean (range) = 54.7 (40-74)yrs for steroid	Meas (SD) = 45.5 (8.5)yrs
65	120	128	43
US or palpation-guided	Palpation-guided	Palpation-guided	Palpation-guided
No adverse events reported	58/60 patients in the NSAID group experienced complications (largely	One case of injection site infection was reported in the steroid	No adverse events reported
Patients in both the ultrasound guided and unguided injection groups showed a statistically significant reduction in VAS pain scores, heel tenderness, and plantar fascia thickness when compared with the placebo group. There was no difference in outcome for US vs palpation-guided injection	Local injection of steroid is more effective in the treatment of plantar fasciitis than oral NSAIDs	Radiation therapy is more effective at relieving pain than palpation-guided steroid injection for plantar fasciitis	While both groups achieved significant improvements at the 3, 6, and 12 week follow-ups, the steroid injection group demonstrated better outcomes at all 3 time points. Improvements were sustained for the joint mobilisation and stretching group for a period of time ranging from 12 weeks to 1 year, but not for the steroid injections.
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	Foot and Ankle Ability Measure (FAAM)
-	-	-	-
-	-	-	-
Both US and palpation-guided steroid injection resulted in significant improvement in heel pain, heel tenderness index, and plantar fascia thickness at 6 and 12 weeks compared to placebo, with the exception of heel tenderness index at 6 weeks for US-guided steroid injection. There was no difference between US and palpation-guided approaches	Pain was significantly lower for the steroid injection group at all timepoints. The recurrence of heel pain was significantly lower in the steroid group (6/60 patients vs 33/60 patients for NSAID).	Pain VAS, function score, and pain score were significantly improved in the radiotherapy group compared to steroid injection at 3 and 6 months	Pain and functional outcomes improved at 3, 6, and 12 weeks follow-up for both groups, with significantly better results for steroid injection. There was no significant difference between groups at 12 months for either outcome
Baseline and 6 and 12 weeks	Baseline and 1, 2, 4, and 8 weeks	Baseline and every 6 weeks for 6 months	Baseline and 3, 6, 12, and 52 weeks
VAS for pain, heel tenderness index, foot posture index, ultrasound of plantar fascia thickness	VAS for pain, recurrence of heel pain	VAS for pain, modified von Pannewitz pain score, and 5-level function score	VAS for pain (during daily living activities) and Food and Ankle Ability Measure
Placebo injection	NSAID	Radiation therapy	Joint mobilisation and stretching exercises
Insertion parallel to heel pad in line with the long axis of the transducer	Injected into the tender most point of the plantar fascia	Anteromedial insertion at the tenderest point	Medial
+	+	+	+
20mg	40mg	40mg	40mg
Methylprednisolone	Methylprednisolone	Methylprednisolone	Methylprednisolone
UK	India	Turkey	Turkey
2013	2011	2015	2016
Ball et al	Biswas et al	Canyilmaz et al	Celik et al

Chen et al	2013	Taiwan	Betamethasone	7mg	+	Posterior heel	device-guided ultrasound vs palpation guidance injections	VAS for pain, tenderness threshold, heel pad thickness, plantar fascia thickness, and SF-36 (physical subscale)	Baseline and 3 weeks and 3 months	Both US and palpation-guided steroid injection resulted in significant improvements in heel pain, tenderness threshold, and thickness of the plantar fascia. The device-assisted US-guided group demonstrated significantly improved tenderness threshold and pain score compared to the palpation group. Physical health status was significantly higher in the device-assisted group, although this was not significantly different between the two groups at any time point.	-	-	-	-	-	Device-assisted ultrasound-guided injection for treating plantar fasciitis results in better therapeutic outcomes than palpation-guided injection	Not reported	US vs palpation-guided	33	Mean (SD) = 54.25 (11.7)yrs for palpation-guided and 55.69 (9.38)yrs for device-	Unilateral plantar fasciitis	Tenderness to the pressure at the origin of the plantar fascia on the medial tubercle of	> 8 weeks	Failure to respond to at least 4 weeks of conservative treatment

Failure of conservative interventions (NSAIDs, heel pads, insoles, night splints) and stretching exercises	Failure of conservative therapies (PT, NSAIDs, stretching exercises, heel cushion) for > 2 months
> 6 months	> 2 months
Presence of heel pain during the first steps after a period of rest or exacerbated by walking/standing over many hours + pain with pressure over the calcaneal tuberosity	Tenderness to pressure at origin of the PF on the medial tubercle of the calcaneus, complaint of heel pain in the
Chronic plantar fasciitis	Chronic plantar fasciitis
Mean (SD) = 51.50 (14.79)yrs for botulinum group and 56.36 (14.71)yrs for the steroid group	Mean (SD) = 41.45 (8.05)yrs for ESWT group and 42.85 (8.62)yrs for steroid group
56	40
Palpation-guided	Palpation-guided
No adverse events reported	No adverse events reported
Botulinum toxin type A should be considered for the treatment of chronic plantar fasciitis in view of the improvement found at one month, and particularly at six months, when this treatment clearly has better results than corticosteroid injections. Further studies with larger samples are necessary to confirm these results	Both interventions caused improvement in pain and functional ability 2 months after treatment. Although inter-group differences were not significant, foot function was improved more with ESWT and patients were more satisfied with ESWT, thus shockwave therapy seems a safe alternative for management of chronic plantar fasciitis
-	Patient satisfaction with treatment
-	-
-	-
Foot Health Status Questionnaire	Foot Function Index
-	-
-	-
Foot Health Status Questionnaire	Baseline and 1 and 6 months	One month after injection there was a clear clinical improvement in both treatment groups but it was greater in the botulinum toxin group, with a significant difference for the pain item (P=0.069), though not in other items. At six months, patients treated with botulinum toxin type A had continued to improve in all items, whereas the corticosteroid group lost part of the improvement achieved at one month (improvement with botulinum toxin vs. corticosteroid: pain 19.10/−6.84 (P=0.001), function 16.00/−8.80 (P<0.001), footwear 13.48/−7.95 (P=0.004), self-perceived foot health 25.44/−5.41 (P<0.001)	VAS for pain (morning and daytime), Functional Foot Index, patient satisfaction with treatment	Baseline and 2 and 8 weeks	Pain and FFI score improved significantly for both groups, with no significant between group differences. There was no significant difference in satisfaction between groups
Botulinum toxin type A	Radial extracorporeal shock wave therapy (ESWT)
Area of the calcaneal tuberosity	Most tender point (medial plantar or inferior calcaneal area)
+	+
12mg	40mg
Betamethasone	Methylprednisolone
Spain	Iran
2011	2016
Diaz-Llopis et al	Eslamian et al

Failture of conservative	Not reported	Not responded to cushioned insoles, stretching exercises, and PT
> 3 months	Between 3 months and 1 year	> 12 months
Tenderness at the plantar fascia	Clinical diagnosis of PF	Not reported
Plantar fasciitis	Plantar fasciitis	Chronic plantar fasciitis
Mean (SD) = 41.4 (12.22)yrs	Mean (range) = 51.0 (32-65)yrs	Mean (range) = 55.6 (31-79)yrs
61	24	60
Palpation-guided	Palpation-guided	Palpation-guided
No adverse events reported	No adverse events reported	No adverse events reported
Both tenoxicam and steroid injection are similarly effective at treating patients with PF	Cryopreserved human amniotic membrane injection may be safe and comparable to corticosteroid injection for treatment of PF. This is a pilot study and requires further investigation	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 steroid, its effect does not wear off with time. At 12 months, PRP is significantly more effective than steroid, making it better and more durable than cortisone injection
-	-	-
-	-	-
-	-	-
Roles and Maudsley Score	FHSQ	Roles and Maudsley Score and the American Orthopaedic Foot and Ankle Society Score
-	-	-
-	-	-
There was a significant improvement in pain for both groups, with no between group differences.	In the 1-injection group, shoe fit at 6 weeks (P = .0244) and general health at 6 weeks (P = .0132) were statistically greater in the steroid group. In the 2-injection group, foot pain score at 18 weeks (P = .0113) was statistically greater in the c-hAM group, indicating an improvement in foot pain. All other variables resulted in no significant difference. There were no significant differences between groups for pain scores. Patient-reported improvement in symptoms at 12 weeks was significantly great in the 1-injection steroid group.	At 3 months, both steroid and PRP groups demonstrated significant improvements across all outcomes, with no significant between-group differences. At 6 months there was no significant difference between groups for any outcome. At 12 months, all outcomes were significantly better for PRP than for steroid.
Baseline and 6 and 12 months	Baseline and 6 and 12 weeks (18 weeks in 2-injection cohort)	Baseline and 3, 6, and 12 months
VAS for pain, and Roles and Maudsley Score (patient satisfaction)	Foot Health Status Questionnaire (FHSQ), VAS for pain, and patient-reported % improvement	Roles-Maudsley Score, VAS for pain, and the American Orthopaedic Foot and Ankle Society Score
Tenoxicam injection	Cryopreserved human amniotic membrane (c-hAM)	Platelet rich plasma (PRP) injection
Medial approach using peppering	Approach toward the medial calcaneal tuberosity down to the level of the periosteum	Point of maximal tenderness using the peppering technique
+	+	+
40mg	40mg	40mg
Methylprednisolone	Methylprednisolone	Triamcinolone
Turkey	USA	UK
2013	2015	2015
Guner et al	Hanselman et al	Jain et al

Failure of conservative treatment (heel pads	Not reported	Failed to respond to at least 6 months conservative treatment
> 6 monts	> 6 weeks	> 6 months
Not reported	Complaint of plantar heel pain, worse on rising in morning and/or after periods of sitting or lying and site of maximal tenderness at the attachment of	Heel pain localised to the medial tubercle of the calcaneum
Plantar fasciitis	Chronic plantar fasciitis	Plantar fasciitis
Mean (range) = 50.7 (26-70)yrs	Mean (SD) = 48.3 (10.5)yrs for autologous blood and 49.2 (11.1)yrs for steroid	Mean (SD) = 54.74 (10.16)yrs fpr MSN group and 56.03 (9.25)yrs for
45	64	61
Palpation-guided	Palpation-guided	Palpation-guided
Not reported	No reports of fat pad atrophy, infections, or rupture of the PF. All patients found the injections painful	For mini-scalpel needle - 6 reports of minor side-effects residing within 48hrs
Autologous blood or anaesthetic injected using the peppering technique are comparable in effectiveness to steroid injection	Intralesional autologous blood injection is efficacious in lowering pain and tenderness in chronic plantar fasciitis, but corticosteroid is more superior in terms of speed and probably extent of improvement	Miniscalpel-Needle treatment is safe and more effective than steroid injection in treating PF
-	-	-
-	-	-
-	-	-
AOFAS score	-	-
-	-	-
-	-	-
At 6 months, all treatments resulted in significant improvements in pain and AOFAS score, with no significant between-group differences	There were significant improvements in pain and tenderness threshold for both treatment groups, although there was no significant between-group differences at 6 months. Steroid injection had significantly better tenderness threshold compared with autologous blood at 6 weeks, 4 months, and 6 months. Repeated-measures *F* test for pain and tenderness threshold showed no significant difference between groups over time.	All measures of pain significantly improved at 1, 6, and 12 months compared to baseline after microscalpel-needle release treatment, whereas steroid injection resulted in improvements at 1 month but not at 6 or 12 months
Baseline and 6 months	Baseline, 6 weeks, 3 months, and 6 months	Baseline, and 1, 6, and 12 months
VAS for pain, rearfoot score of the American Orthopaedic Foot and Ankle Society	VAS for pain and tenderness threshold (using pressure algometer)	VAS for pain (morning, activity, overall ratings)
Anaesthetic using the peppering technique or	Intralesional autologous blood	Miniscalpel needle release treatment
Plantar aspect of the heel pad	Medial side of foot near the plantar surface	Injected into the tender most point of the plantar fascia
+	+	+
40mg	20mg	20mg
Methylprednisolone	Triamcinolone	Triamcinolone
Turkey	Malaysia	China
2006	2007	2014
Kiter et al	Lee & Ahmad	Li et al

Failed to respond to conservative therapy (PT, NSAIDs, bracing, orthotics) for > 3 months	Not previously treated	Not currently receiving treatment for PF
> 3 months	< 6 weeks	> 8 weeks
Heel pain localised to the medial tubercle of the calcaneum	Morning heel pain, local tenderness at the tuberosity of calcaneus in dorsiflexion	Pain on palpation of the medial calcaneal tubercle or the proximal PF and PF thickness of
Chronic plantar fasciitis	Acute plantar fasciitis	Plantar fasciitis
Mean (SD) = 30.72 (7.42)yrs for autologous blood, 33.92 (8.61)yrs for steroid injection and 35.48 (9.54)yrs for	Mean (SD) = 43.91 (7.96)yrs for ESWT group and 44.68 (9.39)yrs for steroid	Mean (SD) = 51.7 (11.9)yrs for steroid group and 52.6 (9.9)yrs for placebo
75	84	82
Palpation-guided	Palpation-guided	US-guided
Not reported	Not reported	No adverse events reported
Local injection of platelet-rich plasma or corticosteroid is an effective treatment option for chronic PF. Platelet-rich plasma injection is as effective if not more effective than corticosteroid injection in treating chronic PF	Both ESWT and steroid injection can be used as initial treatment options for treating patients with acute plantar fasciitis; however, steroid injection is more effective	A single ultrasound guided dexamethasone injection is a safe and effective short term treatment for PF. It provides greater pain relief than placebo at four weeks and reduces abnormal swelling of the PF for up to three months; however, significant pain relief did not continue beyond four weeks
-	-	-
-	-	-
-	-	-
AOFAS score	-	-
-	-	-
-	-	-
There were significant improvements in pain and AOFAS score at 3 weeks and 3 months for both treatment groups, but not for placebo. There were no significant differences between platelet rich plasma injection and steroid injection, with the exception of significantly better AOFAS score in the plasma-rich plasma group at 3 months	Pain intensity significantly improved in both groups compared to baseline at all time points, with significantly greater improvement in favour of steroid injection. Treatment failure in 14.7% of cases for steroid injection and 55.9% of cases for ESWT	There was significantly greater improvement in pain for steroid injection compared to placebo at 4 weeks, but not at 8 or 12 weeks. PF thickness was significantly better for the steroid injection group at 4, 8, and 12 weeks
Baseline, 3 weeks, and 3 months	Baseline and 3, 6, and 12 weeks	Baseline and 4, 8, and 12 weeks
VAS for pain and American Orthopaedic Foot and Ankle Society (AOFAS) Ankle and Hindfoot score	VAS for pain, pain recurrence	Pain rating (foot pain domain of foot health status questionnaire) and PF thickness
Platelet rich plasma (PRP) injection and placebo injection	Extracorporeal shock wave therapy (ESWT)	Placebo (saline) injection
Injected into the tender most point of the plantar fascia, using pepporing technique	Injected into point of maximum tenderness at the inframedial calcaneal	Medial oblique approach, guided by US into the proximal PF
Not reported	+	+
40mg	40mg	4mg
Methylprednisolone	Methylprednisolone	Dexamethasone
India	Iran	Australia
2016	2015	2012
Mahindra et al	Mardani-Kivi	McMillan et al

Non responsive to > 4 months of conservative	No previous treatment	Not reported	Not reported	Not reported
> 4 months	Not reported	Not reported	Not reported	Not reported
Radiographic and MRI examination	Not reported	Median (10-90 percentile) = 10 (4–36) months	Pain on waking or after prolonged sitting, with	Inferior heel pain that is worse with first steps in morning or
Chronic plantar fasciitis (unilateral)	Heel pain	Plantar Heel Pain Syndrome	Plantar fasciitis	Plantar fasciitis
Mean (range) = 59 (24-74)yrs for steroid group	Not reported	Median (10–90 percentile) = 55 (33–68) years	Most frequent age group was 25-45yrs (68%)	Mean (SD) = 44.5 (15.5)yrs for steroid group and 42.5 (17.5)yrs
40	90	45	276	30
US-guided	Not reported	Palpation-guided	Palpation-guided	Not reported
Not reported	Not reported	Not reported	Not reported	Not reported
Platelet-rich plasma injection was more effective and durable than steroid injection for the treatment of chronic recalcitrant cases of PF	Corticosteroid injection together with casting was more effective at treating heel pain than use of heel pads	Although there is a natural course of improvement with Plantar Heel Pain Syndrome, 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	As both treatment modalities are comparative in treatment outcome, it is better to go for conservative approach because this can avoid the complications of steroid therapy	PRP was more effective than steroid injection in relieving the short-term symptoms of PF
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
AOFAS score	-	-	-	FHSQ
-	-	-	-	-
-	-	-	-	-
platelet-rich plasma injection resulted in significantly greater improvement in AOFAS score compared with steroid injection at 3, 6, 12, and 24-months	Steroid injection + casting was significantly more effective than heel pad alone.	All groups demonstrated significant improvement in pain between baseline and weeks 1, 6, and 26, with a significant between-group difference at 6 weeks for steroid injection alone vs anaesthetic block or steroid injection + anaesthetic block. Heal Tenderness Index was significantly better for anaesthetic block alone at 6 weeks compared to the other groups	No significant difference between groups at 4 or 8 weeks	Both treatments resulted in significant improvements in pain and FHSQ score at 6 weeks, with significantly greater improvement in the PRP group compared with the steroid group
Baseline and 3, 6, 12, and 24 months	Baseline and 6 months	Baseline and 1, 6, and 26 weeks (baseline and 6 weeks for Heel Tenderness Index)	Baseline, 4, and 8 weeks	Baseline and 6 weeks
American Orthopaedic Foot and Ankle Society (AOFAS) Ankle and Hindfoot score	VAS for pain	VAS for pain and Heel Tenderness Index	VAS for pain	VAS for pain and Foot Health Status Questionnaire (FHSQ)
Platelet-rich plasma injection	Heel pad	Tibial nerve block	Conservative treatment consisting of NSAIDs	Platelet-rich plasma injection
Periosteum of the medial calcaneal	Injected into region of	Injected directly to the PF, through the heel pad	Not reported	Not reported
+	Not reported	+	+	Not reported
40mg	80mg	80mg	40mg	Not reported
Methylprednisolone	Prednisolone	Methylprednisolone	Methylprednisolone	Not reported
USA	Iran	UK	India	Egypt
2014	2008	2009	2014	2012
Monto	Motififard et al	Mulherin & Price	Narula et al	Omar et al

Not reported	Non-responsive to conservative treatment (NSAIDs, activity modification, shoe	Mixture of previous therapies and no prior therapy
>12 months	>3 months	Not reported
Inferior heel pain with pain through direct palpation of the medial calcaneal tubercle or proximal PF	Presence of post-static dyskinesia, presence of heel pain as pain made worse in postures with	tenderness centered on the medial tubercle of the
Chronic plantar fasciitis	Chronic idiopathic plantar fasciitis	Plantar fasciitis
Mean (SD) = 52.4 (7.5)yrs for PT and 46.2 (8.5)yrs for steroid	Mean (SD) = 45.20 (11.75)yrs for US group and 46.45 (8.84)yrs for palpation group	Not reported
65	21	60
Palpation-guided	US vs palpation-guided	Radiographically marked
Not reported	Not adverse events reported	Not adverse events reported
Workers standing for prolonged periods experienced the same short-term therapeutic effectiveness with a physiotherapy led exercise program compared with an injection of corticosteroid with stretching	Ultrasound-guided and palpation-guided local corticosteroid injections were effective and successful in treatment of PF. Both techniques improved PF clinically and ultrasonographically without statistically significant superior results for the ultrasound-guided injection	PRP injection is more effective than steroid injection at relieving pain from PF
-	-	-
-	-	-
-	-	-
Foot and Ankle Disability Index	Plantar Fasciitis Pain/Disability Scale	-
-	-	-
-	-	-
Significant improvements observed for pain and FADI at 6 and 12 weeks compared with baseline, with no between group differences. No significant changes to PF thickness at any timepoint, although the number of cases with focal anechoic areas and the size of these areas improvemed significantly in both groups at 12 weeks	Significant improvements for all outcomes in both groups, with no between group differences at either 2 or 4 weeks. At 4 weeks after injection, the hypoechogenicity disappeared in all patients of both groups	At 1 month, both treatment groups demonstrated a significant improvement in pain, sustained at 3 and 6 months. PRP resulted in significantly greater pain reduction than steroid injection at 1, 3, and 6 months
Baseline and 6 and 12 weeks	Baseline, 2 and 4 weeks	Baseline, 1, 3, and 6 months
VAS for pain (at work and with activities of daily living), Foot and Ankle Disability Index, and PF thickness (US-assessed)	VAS for pain, Plantar Fasciitis Pain/Disability Scale, PF thickness and echogenicity (US-assessed)	VAS for pain
Physiotherapy-based exercise program	US vs palpation-guided	Platelet-rich plasma injection
Anteromedial to the focal point of pain in the inferior heel	Medial approach through the maximally tender spot on the plantar surface of the heel	Medial aspect of the heel at point of maximum tenderness
+	+	+
Not reported	20mg	40mg
Dexamethasone	Triamcinolone	Methylprednisolone
Canada	Egypt	India
2014	2015	2013
Ryan et al	Saba & El-Sherif	Tiwari & Bhargava

Non-responsive to conservative treatments (NSAIDs, US diathermy, TENS, stretching exercise) for > 2 months	Not reported	Failed to respond to > 6 months conservative
>2 months	Mean (SD) = 30.21 (30.82) months for autologous blood group and 15.52 (11.87) months for steroid	> 6 months
Tenderness to pressure at the origin of the PF on the medial tubercle of the calcaneus AND sharp shooting inferior foot pain made worse	Not reported	Post-static dyskinesia and pain on palpation
Plantar fasciitis	Plantar fasciitis	Chronic plantar fasciitis
Mean (SD) = 49.8 (10.8)yrs for palpation group and 53.0 (11.4)yrs for US group	Mean (SD) = 42.71 (8.07)yrs for autologous blood group and 48.28 (11.27)yrs for steroid group	Mean (SD) = 43.9 (8.22)yrs
25	60	60
US vs palpation-guided	US-guided	Palpation-guided
Not reported	Not reported	All persons receiving steroid injection had pain lasting a mean
Steroid injection can be an effective way to treat PF, and injection under sonographic guidance is associated with lower recurrence of heel pain	Intralesional steroid injection and autologous venous blood injection have comparable effectiveness in the treatment of pain with PF, although steroid injection was more effective at improving heel pad thickness and the diameter of the site of inflammation	Corticosteroid injection and ESWT are comparable in effectiveness in treating the symptoms of chronic PF
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
VAS for pain, tenderness threshold, PF thickness, PF echogenicity, and recurrence of heel pain	VAS for pain, heel pad thickness, and diameter of inflammation site	VAS for pain and heel tenderness index
Baseline, 2 weeks, 2 months, and 1 year	Baseline, 6 weeks, 3 months, and 6 months	Baseline and 3 months
Pain, tenderness threshold, PF thickness, and PF echogenicity improved significantly in both groups. Between group analyses favoured sonographic guideance for improving tenderness threshold at 2 weeks, 2 months, and 1 year, for improving pain at 1 year, and reducing PF thickness at 1 year. Recurrence of heel pain was significantly greater in the palpation-guided group	Both treatment groups resulted in significant improvements in pain at 6 weeks, 3 months, and 6 months, with no significant between group differences. Compared with autologous blood injection, steroid injection was significantly more effective at reducing heel pad thickness and diameter of the inflammation site	Both treatments resulted in significant improvements in pain and heel tenderness index scores, with no significant between group difference
US vs palpation-guided	Autologous venous blood injection	Extracorporeal shock wave therapy (ESWT)
Posterior heel parallel to the long axis of the transducer (US) or anteromedially to the tenderest point in the inferior heel near the	Not reported	Medial side of heel
+	Anaesthetic spray	+
7mg	Not reported	2.2mg
Betamethasone	Triamcinolone	Betamethasone
Taiwan	Turkey	Turkey
2006	2015	2010
Tsai et al	Yesiltas et al	Yucel et al

Yucel et al	2009	Turkey	Betamethasone	3.2mg	+	Medial approach	Palpation, US, or scintigraphy-guided	VAS for pain intensity, heel pad thickness, and PF thickness	Baseline and 25.3 months	US-guidance resulted in significant improvements in pain, heel pad thickness, and PF thickness, palpation-guidance resulted in significant improvements in pain and PF thickness, and scintigraphic-guidance resulted in improvement in pain only. There were no between group differences at follow-up	-	-	-	-	-	US-, palpation-, and scintigraphy-guidance were all effective in the treatment of plantar fasciitis, and there was no statistically significant difference between these techniques in terms of plantar fascia thickness, fat pad thickness, and pain rating	Not reported	Palpation, US, or scintigraphy-guided	27	Mean (SD) = 45.8 (12.0)yrs	Plantar fasciitis	Tenderness localised to the medial tubercle of the [illegible]	Not reported	Failed to respond to conservative treatment with [illegible]
Yucel et al	2013	Turkey	Betamethasone	4.5mg	+	Medial approach	Full-length silicone insole	VAS for pain, Heel Tenderness Index, Foot and Ankle Outcome Score (FAOS), PF thickness	Baseline and 1 month	Significant improvements were observed for both groups in VAS, Heel Tenderness Index, FAOS, PF thickness. Pain scores, FAOS for pain, FAOS for activities of daily living, FAOS for sport and recreation function, and PF thickness were better in injection group than in insole group	-	FAOS	-	FAOS	-	Both ultrasound-guided corticosteroid injection and wearing a full-length silicone insole were effective in the conservative treatment of PF, although we recommend the use of silicone insoles as a first line of treatment for persons with PF	No adverse events reported	US-guided	44	Mean (SD) = 45.6 (9.3)yrs for steroid and 47.4 [illegible]	Chronic plantar fasciitis	Tenderness localized to the medial tubercle of the [illegible]	> 3 months	Not reported

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