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Efficacy of acupuncture in treating scars following tissue trauma

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Abstract

Introduction: Anecdotally, acupuncture is used in the treatment of scar tissue in order to improve scar quality and reduce symptoms of pain and pruritus. Unlike conditions such as lower back pain, knee osteoarthritis and migraines, there are no systematic reviews to confirm treatment efficacy. This systematic literature review aims to assess the current level of evidence for the use of acupuncture for treating abnormal scars such as hypertrophic or other symptomatic scars.

Methods: A comprehensive database search was performed followed by reviewing reference lists, grey literature databases and Google Scholar. Study quality was assessed using the Oregon CONSORT STRICTA instrument (OCSI) for clinical trials and the Joanna Briggs Institute (JBI) checklist for case reports.

Results: The search strategy discovered five case studies, one retrospective cohort study, one cohort study and three clinical trials that investigated the use of acupuncture for scars. Studies rated as low to moderate quality (26–50%) on the OCSI checklist due to lack of detailed reporting, use of non-validated outcome measures and heterogeneity of participant cohorts. Three case studies rated as moderate quality (5–6/8) and two as low quality (<2/8) on the JBI checklist.

Discussion: All studies reported positive outcomes for the use of acupuncture for scar symptoms; however, treatment frequency, duration, number of treatments and points used varied between studies.

Conclusion: Acupuncture for the treatment of abnormal scars has a low level of evidence thus requiring further well-designed, controlled trials to be performed. Recommended treatment protocols for future studies have been provided.

Keywords

Acupuncture, dry needling, hypertrophic scar, burns, neurogenic inflammation, pruritus

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Summary

This literature review investigated the current research for using acupuncture to treat abnormal or symptomatic scars. The primary symptoms investigated were pain and itch; however, scar quality was also considered in some studies. We aimed to assess the quality of available evidence and make recommendations for studies to be performed in the future.

Very few clinical trials have been published so far. We found a total of three clinical trials comparing acupuncture to either a sham (placebo) treatment or usual care. Two studies without a comparison group and five case reports of individual treatments were also discovered. Participants had scars from either burns injury or surgery. They received acupuncture treatment at various time points (from 30 min up to one year after injury). How the treatment was performed was different across all studies, meaning the results were not comparable and few conclusions could be drawn on effectiveness. Although all studies showed positive results overall, there were many missing details or poor methods used which reduced the quality of results.

As all studies reviewed used different treatment methods, it is unknown which treatment components are most important. Therefore, recommendations have been made for future research and suggested treatment parameters to be used to improve the quality and consistency of research using acupuncture for scars.

Introduction

Acupuncture is the therapeutic insertion of fine needles into the body.[1] It originated as one component of traditional Chinese medicine (TCM), based on the vitalistic paradigm of qi (metaphysical vital energy force).[2,3] Orthodox, medical use of acupuncture dates back to the early 1800s.[1,3,4] Subsequently, Western health practitioners have adapted acupuncture into a conventional biomedical practice based on anatomy, neuroscience, pathology and evidence-based medicine, rather than the Chinese qi-based paradigm.[1,5]

Empirically, acupuncture has been utilised for centuries to treat skin conditions including scars.[6–8] Scar tissue is theorised to have the capacity to obstruct the circulation of qi and xue (nourishing of blood), with scar tissue demonstrating characteristics of stagnation of xue.[6–8] In biomedical terms, scar tissue may cause adhesions between layers of skin and connective tissue (fascia) resulting in disordered circulation around the scar and adjacent areas.[9] Filshie and White[10] noted in 1998 that there was a scarcity of publications evaluating acupuncture treatment of scars. The first publication discussing acupuncture treatment of scars appeared in 1982.[11] Subsequently, a limited number of case studies and controlled trials were published. However, a systematic review of scar- and acupuncture-related material has not been undertaken until now. This review will discuss current scar management, critically appraise the available literature on acupuncture treatment of scars and make recommendations for future acupuncture research for scars.

Uncomplicated skin healing processes in humans other than neonates leaves a flattened scar that fades as it matures.[12] However, abnormal or prolonged healing responses can lead to the formation of abnormal scars such as hypertrophic scars (HTS) and keloid scars.[12] Factors in burn injuries contributing to the formation of HTS include the severity of the trauma, time to heal, infection and inflammation prolonged beyond two weeks.[13,14] A reduced early inflammatory response, demonstrated by low concentrations of inflammatory proteins at 3 h after wounding, could be a factor in surgical scars becoming hypertrophic.[15] In the first six months after tissue injury, HTS rapidly develop and are often raised, red, itchy and painful. They may take several years to reach maturity which is accompanied by progressive reduction of adverse symptoms.[12,14]

During wound healing, increased nerve density in and around the scar is normal in the first few weeks of healing. This gradually decreases to equal or lower than that of uninjured skin during scar maturation.[16] However, chronically painful scars have been shown to have a higher density of nociceptive fibres than non-painful scars.[17] Choi et al.[18] described a correlation between increasing scar thickness and intensity of itch sensation ($P < 0.05$) but found no evidence that scar pain was associated in the same way in post-burn HTS. Itch is mediated by low level C-nociceptor stimulation for which high levels of stimulation result

in pain.[19] During movement, a thicker scar may be more likely to activate mechanosensitive ergoreceptors due to pressure and stretch yet remain sub-threshold for pain. Mechanical stimulation of sensory receptors induces neuropeptide release that further stimulates chemically sensitive nociceptors and leads to neurogenic inflammation of the scar tissue, disrupting and prolonging the healing process.[20] Therefore, increased scar thickness, reduced pliability and greater density of nociceptors can be associated with abnormal tissue healing resulting in symptomatic, slow maturing scars.[16,21] Acupuncture treatment stimulates mechanoreceptors and nociceptors in the skin and underlying tissue and is thought to enhance the activity of inhibitory neural mediators, thereby modulating neurogenic inflammation.[22]

Current treatments for HTS

Clinical evidence in the treatment of HTS has been driven by clinical experience, rather than gold standards or guidelines underpinned by research evidence.[23] Current conservative scar treatment modalities such as pressure garments, silicone, topical ointments or gels, and massage show positive effects on scar redness, thickness and pliability.[24] However, their ability to influence pain and itch is limited.[25–31] Lu[26] reported that pressure garments are thought to control excess collagen synthesis by limiting supply of blood, oxygen and nutrients to the scar. Moreover, by speeding up the maturation process and encouraging realignment of collagen bundles, scar thickness and colour are closer to that of normal skin. Silicone is believed to improve skin hydration and reduce overactivity of fibroblast cells associated with excess collagen formation.[25,30] Hence, it may reduce scar thickness and improve elasticity. Combining pressure therapy with silicone gel sheeting produced the greatest reduction in scar thickness compared to either therapy applied alone.[31] Potential effects of massage include mechanical disruption of scar tissue leading to improved pliability.[25] The evidence in support of their long-term efficacy is lacking.[28] Sidgwick et al.[28] further comment on an unmet need of effective treatments for scar factors that affect patients the most, such as inflammation and pruritis.

Medical management of HTS may include surgical excision, autologous fat grafting, percutaneous collagen induction (PCI), intralesional corticosteroid/other product (i.e. platelet-rich plasma [PRP]) injections, radiotherapy, ablative and colour laser therapies and antihistamine drugs.[27,32–37] Both PCI and fat grafting are invasive techniques performed under surgical conditions on large surface area, mature scars. PCI, also called medical needling, has shown promising results in human and animal models.[32,38] The technique involves using a medical roller containing small needles to repetitively pierce the scar to the level of the dermis, while the skin is anaesthetised, promoting a healing response. Such damage is thought to stimulate collagen fibre remodelling, resulting in reduced scar thickness and improved appearance of scarred skin.[38] Acupuncture is similarly an invasive technique; however, because it is specifically targeted treatment using fine gauge needles and a low number of needle insertions, it causes far less local tissue damage than the techniques listed above. Side effects such as pain, bruising, bleeding and swelling are lesser with acupuncture treatment making it more tolerable and less expensive for the patient than other options.

Abbate[39] recommended inserting acupuncture needles into tender points around the scar and retaining them for 5–10 min to mechanically break up obstructions and re-establish energy pathways. In this context, acupuncture is applied in a manner theorised to access and modulate the flow of qi in meridian channels, to influence the spiritual and physical health and wellbeing of the individual.[40] TCM practitioners believe that scars 'block' or alter qi flow along meridian channels, causing a systemic energy imbalance leading to dysfunction elsewhere in the body.[11,39,41] Hence, by this reasoning, treatment for other conditions may be ineffective if the 'blockage' caused by the scar is not addressed.[11,39,41] An example of the TCM practitioner belief of scars leading to dysfunctions elsewhere in the body is depicted from a series of limited quality case reports published in 1982 by Rogers.[11] Patients with abdominal scars were treated for back pain, fatigue, weight gain, deafness and headaches. Rogers reported that acupuncture treatment, aimed at the scar as well as the presenting problem, reduced sensitivity and abnormal colouring of scars and resolved or greatly improved the presenting problem following treatment (except in one case of deafness).

In unpublished lecture notes from 2001, Bradnam discussed treatment of scars from a western medical perspective, recommending local application of needles around the scar to stimulate sensory neuropeptide release and activate segmental inhibitory analgesic mechanisms. Another proposed local mechanism of effect is that of

mechanotransduction. Manual acupuncture needle rotation within the connective tissue planes causes winding or local stretching of collagen fibres around the needle, generating mechanical signals.[42–48] Potential effects include synthesis and release of growth factors, cytokines, enzymes and structural components of the extracellular matrix.[47]

A survey of physiotherapists in New Zealand found that 70–75% of respondents used acupuncture for treating scars Luty, A., 2000 cited in unpublished lecture notes by Bradnam, 2001 physiotherapists who used acupuncture to treat scars aimed to influence the scar itself, improving tissue pliability and to reduce symptoms such as pain and itch.

Studies on acupuncture for itch demonstrate that acupuncture applied locally to the itch or in the same neural segment (dermatome or myotome) reduced itch.[49–51] Correspondingly, distant needle placement had minimal effect in both humans and animals (assessed by scratch responses).[29] Local and segmental acupuncture stimulation will provide sensory input into the same segmental spinal nerves as the itch sensation.[52,53] Therefore, acupuncture may modulate signals at the level of the dorsal horn reducing intensity of noxious signals being sent to the central nervous system for processing.[53]

Itch, induced in human skin via intradermal histamine injection, was reduced through the application of manual acupuncture (MA) and high (80Hz) and low frequency (2Hz) electroacupuncture (EA).[49] EA being the application of measured electrical current to acupuncture needles.[49] Both MA and EA were applied either directly over the area of itch or proximally in the affected dermatome. Treatment applied outside of the affected dermatome demonstrated no significant effect on symptoms. This suggests that needle location plays an important role in itch reduction.[49]

A reduction in scratch response in rats following serotonin-induced itch was also shown following acupuncture treatment.[50] It was demonstrated that acupuncture into the same or adjacent dermatome was more effective than stimulation elsewhere. High frequency EA (HFEA) and MA were both more effective than low frequency EA (LFEA); however, HFEA was more effective than MA at reducing scratching responses.

Literature searches suggest that acupuncture may be used to reduce pain and itch in abnormal scars.[54–56] Further, physical properties of scars including thickness and colour were reportedly improved following acupuncture treatment.[11,55] The aim of this review is to evaluate the current evidence for acupuncture treatment of HTS and recommend future possibilities for research for abnormal scars.

Methodology

The objective was to identify whether local acupuncture treatment is effective at reducing symptoms of abnormal scars such as pain and itch. The search strategy was based on guidelines from the Joanna Briggs Institute (JBI), aiming to find both published and unpublished studies.

An initial search on MEDLINE and CINAHL was undertaken using the following keywords:

> Acupuncture OR dry needling OR needling AND
>
> Scar OR cicatrix OR healing OR inflammation OR pruritus OR neurogenic

Text used in the title, abstract and keywords was analysed to assess whether search terms were sufficient. The keyword 'healing' confounded the search and was removed from the list. The revised search terms were used across the following databases:

EBSCO Health databases, including: CINAHL, Medline, SportDiscus, Dentistry & Oral Sciences; Web of Science, Cochrane, Scopus, AMED and PEDro.

Reference lists of all included articles were searched for further references, as were grey literature databases, relevant acupuncture textbooks and, finally, Google Scholar to ensure all available studies were identified. One unpublished thesis containing a series of case reports using acupuncture among other modalities for scars was discovered. Clinical trials, mechanistic studies and case studies were included. Opinion articles and reviews were excluded, although searched for relevant references.

Studies published before February 2018 were considered for inclusion in this review. Non-English studies, with abstracts published in English, were translated and screened for inclusion. Inclusion criteria stipulated inclusion of human participants with hypertrophic or abnormal scars treated by acupuncture interventions. This encompassed use of a filiform acupuncture needle and could be of the following modalities: acupuncture or dry needling. Because only three studies were located following initial searching, the inclusion criteria were expanded to include acupuncture-linked modalities electroacupuncture and indwelling needle use. Interventions specifically excluded were bee

Table 1. Clinical trial details: Part A.

	Study design	Type of scar	Type of control	Participants (n)	Type of treatment	Needle location
Cuignet et al. (2015)[55]	Cohort	HTS – burn	N/A	32	MA + EA	EA on extremity points of shared meridian and inner bladder line of nerve root supplying meridian of the scar. MA to TCM acupoints including some/all of: SP6, 9, 10, ST40, LI4, 11, BL13, 17
Huang et al. (1999)[63]	Clinical trial (quasi-experimental)	HTS – burn	Usual care	30 (?+30 control)	MA	3 main TCM points (SP10, ST36 and LI11), unclear whether local needles were also used
Kotani et al. (2001)[64]	Clinical trial (RCT)	Abdominal surgery	Sham	70	Indwelling	Local tender points along scar
Loskotova and Loskotova (2017)[66]	Retrospective	Acute burns	Usual care	1008 total individuals over 32 years; comparison made for 198 with acu and 63 without acu	MA	TCM acupoints bilaterally, with combination of: LI4, LI11 and LU7 depending on access to unburnt skin
Song et al. (2011)[65]	Clinical trial (RCT)	HTS –burn	Ultrasound and Scareducer ointment	80	MA	Local around scar

HTS, hypertrophic scar; MA, manual acupuncture; EA, electroacupuncture; TCM, traditional Chinese medicine; VAS, visual analogue scale; QST, quantitative sensory testing; OCSI, Oregon CONSORT STRICTA Instrument; N/A, not available.

venom acupuncture, dermarolling or PCI, moxibustion, cupping, cat gut embedding, plum blossom needling, scar injection needling, prolotherapy and non-skin penetrating acupuncture, e.g. laser acupuncture and acupressure.

Abstracts were obtained for articles that met the inclusion criteria and checked before obtaining full text copies. Screening was performed by two researchers CT and SK. Any discrepancies were resolved through discussion with a third researcher DE.

1. Data analysis

The Oregon CONSORT STRICTA Instrument (OCSI); a tool combining CONSORT[57] and STRICTA[58] was used to rate study quality of randomised controlled trials in this review.[59] The JBI Critical Appraisal Checklist for case reports[60] was applied to review and assess quality of case studies reporting on acupuncture treatment of scars. Studies were reviewed by CT and SK. Any disagreement was resolved by DE. Treatment data and protocol details were extracted by CT.

2. Results

Initial literature searching retrieved 213 citations (see figure 1). Only one clinical trial and two case studies were found that met inclusion criteria, demonstrating a paucity of studies in this area of

Table 2. Clinical trial details: Part B.

	Frequency of treatment	Outcome measures	Results	Statistical analysis	OCSI score (%)	Risk of bias
Cuignet et al. (2015)[54]	30 min, 1× week, duration 3 weeks	VAS pain and itch, QST	4/10–1/10 decrease in itch for all participants; responders had decreased pain by 4 points, non-responders had no change in pain scores; QST revealed difference between responders and non-responders	Adequate use of statistical analysis, including use of *P* values	28	High risk of performance and detection bias
Huang et al. (1999)[62]	Unclear, differed between participants	Unvalidated TCM diagnostic scale	Significant improvement in itch for all participants	Use of *P* values, X^2	34	High risk of selection, performance and detection bias
Kotani et al. (2001)[63]	4 weeks, 20 sessions of 24 h indwelling needles in situ	VAS pain, QST	70% of participants in treatment group had good to excellent outcomes	Adequate statistical analysis including correlations and *P* values	50	Low risk of selection or detection bias; high risk of performance bias
Loskotova and Loskotova (2017)[65]	Daily, 30 min; unclear number of sessions	Unclear, qualitative appearance of burn, colour and presence of HTS	Applying acupuncture within 48 h resulted in complete healing without HTS in 6 weeks	Some use of statistical analysis (X^2), poorly reported	13	Risk of detection and reporting bias
Song et al. (2011)[64]	30 min, ×10 days, 7-day break, ×4	Unvalidated 3-point scale – measuring pain, itch and scar pliability	Total effective rate was 93.9% for the treatment group and 77.8% for the control group after 1 year	Unvalidated outcome measures, basic statistical analysis including *P* values	26	High risk of selection, performance and detection bias

HTS, hypertrophic scar; MA, manual acupuncture; EA, electroacupuncture; TCM, traditional Chinese medicine; VAS, visual analogue scale; QST, quantitative sensory testing; OCSI, Oregon CONSORT STRICTA Instrument.

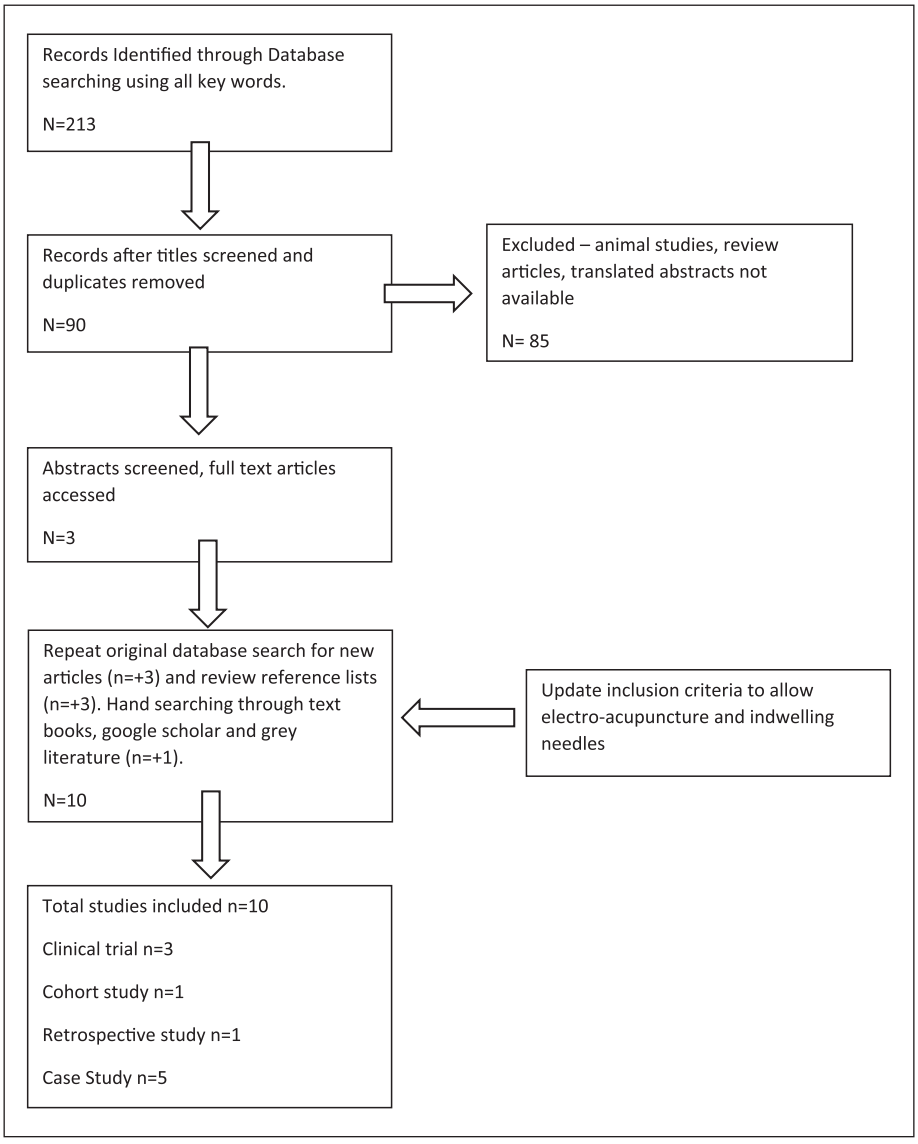

Figure 1. Search Results

research. Hand searches revealed two further studies: one that used a combination of electroacupuncture and manual acupuncture, the other indwelling needles. These are commonly used acupuncture modalities that elicit similar neuropeptide changes as manual acupuncture;[61] therefore, it was decided to expand the search to allow for both electroacupuncture and indwelling or intradermal needle use. Further relevant texts were not located. Review of reference lists of these articles found another two further case studies and one clinical trial (which was translated from Mandarin and reviewed under supervision of SK). Repetition of the search later identified one further retrospective study that had been published since the previous search was undertaken. Finally, a prospective series of case reports was obtained through university records as an unpublished thesis.

None of the clinical trials reviewed (See Table 1 and Table 2) scored > 50% for methodological quality on the OCSI. The case studies (see Table 3) fared equally poorly, scoring 1–6 out of a total of 8 points on the JBI checklist. All were missing significant information and data. Therefore, all clinical and case studies were considered to have a high risk of bias.

Three randomised trials were reviewed. Two were published before the publication of CONSORT and STRICTA[62,63] and the third was published in English as a translation of the original paper from Mandarin.[64] Further non-randomised studies reviewed and included were one cohort and one retrospective study.[54,65]

Table 3. Case report details.

	Type of scar	Needle location	Treatments (n)	Outcomes	Quality rating (JBI checklist)
Anderson (2014)[66]	Dupuytrens contracture surgery	Local plus LI4 and HT7	7 treatments over 3 months	Improved joint ROM, colour and numbness of skin	6/8
Fang (2014)[56]	Post-surgical on thigh	Local and distant – TCM diagnosis	8 treatments over 5 weeks	Pain decreased from 7/10 to 1–2/10	6/8
Hunter (2011)[55]	Post-surgical on wrist	Local only	9 treatments over 4 months	Symptom-free, flatter	2/8
McCowen (2006)[67]	Burns on hand	Local with EA	Unclear, could be just one	Improved joint ROM, and appearance of scar, decreased pain	1/8
Stephenson (2002)[68]	Post-surgical upper limb scars	Local and distant – LI4 and TE5 for pain, or spleen points for swelling	5–16 treatments over 5–8 weeks	Reduced pain and itch on VAS, 75% cases had reduced scar tightness, 75% had improved scar appearance, improved function by 12–81% via DASH score	5/8

TCM, traditional Chinese medicine; EA, electroacupuncture; ROM, range of motion; VAS, visual analogue scale; DASH, Disabilities of the Arm, Shoulder and Hand.

None of these studies provided information on practitioner training or acupuncture experience. Only one study specified that a single practitioner provided of all treatments, used blinded assessors and provided enough detail regarding randomisation techniques, recruitment, adverse events and drop-outs.[63] No studies provided evidence of patient or practitioner blinding.

Details on scar location, size, time since injury and spontaneous healing compared to skin graft were not adequately reported by two studies,[62,64] introducing potential confounding variables. Cuignet et al.[54] provided this information revealing a heterogeneous patient cohort. Kotani et al.[63] recruited individuals with intractable scar pain after failure of standard treatments, such as TENS, topical lidocaine and local anaesthetic injection. Although this limited diagnostic confounding factors, participant beliefs and expectations were not measured, which may be a particularly relevant confounding factor following multiple ineffective treatments.

A meta-analysis of results was not possible due to the limited numbers of studies located, variety of outcome measures used, conditions treated and heterogeneity in needling treatments provided. Two studies utilised different unvalidated scales based on practitioner assessment of colour, 'hardness' and itching with the treatment outcome assessed as either cure, effect or failure. The visual analogue scale (VAS) was used for pain measurement in two studies; however, study design and method of acupuncture treatment were not comparable. Different methods of Quantitative Sensory Testing (QST) were utilised and applied. Pain pressure threshold was used to assess local scar tissue sensitivity and locate points for needle insertion along painful abdominal scars.[63] Electrical stimulation along a shared meridian/dermatome to the scar was hypothesised to assess systemic sensitivity when compared to the opposite and contralateral limb meridian/dermatome.[54]

Adverse events and study completion were inadequately reported by most authors. Two studies reported that participants felt pain on needle insertion;[63,66] however, the second of these was from the control intervention which included injection of local anaesthetic rather than the acupuncture treatment itself. Only one study reported the number and reason for drop-outs,[54] another study reported that they had no drop-outs.[63]

Table 4. Recommended Research Intervention Protocol – comparing local versus distant needle placement.

Study parameters	Recommendation
Age of scar	Six weeks to one year Pain associated with tissue damage fades as healing progresses and a scar is formed, usually around six weeks post-wounding[16] HTS develop in the first six months post-wounding[12,14]
Needle location	Local around the scar (same dermatome), compared with distant (no shared neuroanatomy to scar)
Needles (n)	To be calculated based on scar size/ circumference to ensure equal stimulation between groups Based on placing needles at 2-cm intervals around the circumference of the scar
Needle stimulation	Bi-directional rotation as per Langevin[45], until moderate sensation is achieved and repeated at several intervals throughout treatment
Treatment duration	Acupuncture needles may be retained anywhere from 30 s to 30 min or more (i.e. indwelling)[71] An average duration of 15 min is recommended
Treatments (n)	Six treatments over four weeks
Outcome measures	Must be validated tools such as VAS and POSAS and include Quality of Life measures, i.e. SF-36

Reporting must follow STRICTA and CONSORT guidelines.

Two low-quality case studies were published as brief reports.[55,67] In a prospective case series, Stephenson[68] undertook four case studies of upper limb post-surgical scars combining acupuncture with other treatment modalities. Although this moderate quality (5/8) case series provided detail on outcome measures, it used a self-designed, unvalidated assessment as its primary outcome measure. Patient demographics, history and treatment parameters were not clearly described. A moderate-quality (6/8) case study report failed to gather final outcome measures as the patient declined further follow-up.[56] Anderson[66] provided a moderate-quality (6/8) case study report where acupuncture was combined with other physical treatment modalities. Regrettably, details regarding treatment parameters were not provided. These included specific details of needle placement during each treatment, type and amount of needle stimulation, and whether the acupoints treated distant to the scar were on the ipsilateral or contralateral limb. Positive outcomes were reported following acupuncture treatment; however, follow-up data were not provided for any case study. Hence, it is unknown if improvements were maintained following treatment cessation.

Discussion

Despite rigorous search methods, very few articles were discovered that reported on the use of manual acupuncture for abnormal scars. Initial searching found only three references (one clinical trial and two case reports); hence, a broadening of the inclusion criteria was tried to improve report capture. Since acupuncture modalities—electrotherapy and indwelling needles use the same acupuncture needles and skin piercing technique as manual acupuncture—the authors purport that these modalities have similar modes of action on the skin and neural system. The search was performed again with the new criteria. Further studies were discovered; however, this introduced the potential for confirmation bias (the tendency to search for information to confirm pre-existing beliefs or hypotheses) to this review. This is justified to provide a more comprehensive report on an understudied area of scar management. It must be noted the clinical trials and majority of published case studies are of very low quality, providing insufficient evidence to support the use of acupuncture for HTS.

This review has highlighted the need for well-designed, methodologically rigorous research and case studies using validated outcome measures and clear reporting of results to ascertain whether acupuncture is efficacious in the treatment of abnormal scars. However, empirically clinical results continue to be reported. Therefore, the findings of this review may be applied to providing an outline for future research in this field (see Table 4).

For the clinician treating abnormal scarring, there are many physical treatment options to choose from. Practicing evidence-based medicine (EBM) means to integrate clinically relevant research with the practitioners' clinical expertise, in order to provide the best possible treatment.[69] However, there is no consensus in the literature on treatment parameters when

treating abnormal scars with acupuncture. The most commonly reported treatment method was to place acupuncture needles locally around the scar borders, also known in Chinese medicine as 'surround the dragon'.[70] When discussing acupuncture for scar management, doctors,[71] physiotherapists and TCM practitioners[39] all recommend placing acupuncture needles locally around the scar, akin to 'surround the dragon'. Two of the three controlled trials and all case reports in this review used local acupuncture as the primary type of treatment.

Loskotova and Loskotova state that HTS formation in humans may be prevented or limited by early application of acupuncture treatment.[65] This long-term retrospective series of case studies reported a significant reduction in scarring when acupuncture treatment was provided within 48 h after burn injury. No other studies in human individuals have investigated using acupuncture as an early intervention treatment option following burn injury. Animal studies have demonstrated faster wound closure and less scarring following acupuncture treatment.[72–74] Recommendations regarding scar prevention using acupuncture cannot be made without further clinical trials confirming these findings.

Studies reviewed noted 1–40 treatments at daily, bi-weekly, weekly or longer intervals. Hence, it is unknown what the optimal treatment frequency, duration or placement of needles should be to achieve the best outcomes. Thus, there is not enough scientific evidence to make reliable conclusions at this stage; however, clinicians may choose to be guided by the limited information available combined with their own clinical experience to inform treatment choices.

Recommendations and guidelines for future studies

Future research needs to investigate the use of local versus distant (extrasegmental or TCM-reasoned) acupuncture treatment. Available consensus suggests that local acupuncture application will have a greater influence on itch and connective tissue remodelling than distant acupuncture. Mechanistic studies demonstrate needle rotation, used to produce the sensation of deqi in acupuncture, can cause tissue displacement up to 4 cm away from the needle,[75] further informing the position of needles during locally applied acupuncture treatment for scars. Studies on itch found local dermatomal acupuncture treatment was more effective than that applied outside the segment, at reducing induced itch in human and animal models.[49–51]

The use of distant or sham acupuncture in studies to date have been based on TCM reasoning and point selection. All studies have used at least one acupoint with a shared dermatome /myotome to the affected area,[76] including non-penetrating sham controls which may not be inert treatments.[77,78] The studies that used distal points for acupuncture tended to include points which are known as 'big' points in TCM theory.[79] When these points are investigated from a neuroanatomical perspective, they demonstrate innervation from multiple segmental levels including dermatome, myotome, cutaneous and joint nerve supply; hence, they have input into the sensory nervous system via multiple segmental levels of spinal nerves.[80] Thus, it could be argued that amount of sensory input rather than specific needle location could be a factor in results seen with acupuncture treatment.

Further investigation will help clarify whether itch and pain respond differently to treatment, as there is no evidence to suggest that locally applied acupuncture is more effective at reducing pain than distant acupuncture. Pragmatic trials comparing acupuncture to current best evidence will judge whether acupuncture should be considered as a primary intervention in scar management.

Conclusion

This review concludes that there is insufficient evidence to support the use of acupuncture in the management of abnormal scars due to the lack of quality, unbiased research trials. However, further investigation into acupuncture as a treatment for HTS is warranted; therefore, recommendations for future research studies have been presented.

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