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Acupuncture for systemic lupus erythematosus: a pilot RCT feasibility and safety study

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Abstract

The objective of this study was to determine the feasibility of studying acupuncture in patients with systemic lupus erythematosus (SLE), and to pilot test the safety and explore benefits of a standardized acupuncture protocol designed to reduce pain and fatigue. Twenty-four patients with SLE were randomly assigned to receive 10 sessions of either acupuncture, minimal needling or usual care. Pain, fatigue and SLE disease activity were assessed at baseline and following the last sessions. Safety was assessed at each session. Fifty-two patients were screened to enroll 24 eligible and interested persons. Although transient side effects, such as brief needling pain and lightheadedness, were reported, no serious adverse events were associated with either the acupuncture or minimal needling procedures. Twenty-two participants completed the study, and the majority (85%) of acupuncture and minimal needling participants were able to complete their sessions within the specified time period of 5–6 weeks. 40% of patients who received acupuncture or minimal needling had 30% improvement on standard measures of pain, but no usual care patients showed improvement in pain. A ten-session course of acupuncture appears feasible and safe for patients with SLE. Benefits were similar for acupuncture and minimal needling.

Keywords

acupuncture; pain; randomized controlled trial; systemic lupus erythematosus

Introduction

In efforts to decrease pain and other symptoms, many people, including those with systemic lupus erythematosus (SLE), are integrating complementary medicine modalities into their health care. A study of healthcare utilization in a cohort of 707 SLE patients revealed that 48% used alternative/complementary medicine treatments.¹ Acupuncture (AC) is one of the more frequently researched complementary approaches for rheumatologic conditions. Randomized controlled trials (RCTs) have demonstrated that AC reduces symptoms of chronic osteoarthritis of the back² or knee,^{3–6} and fibromyalgia.⁷

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Author contributions

CG had full access to the data and takes responsibility for the integrity of the data and the accuracy of the data analysis. CG, RG, JB, SS and SM were responsible for the study design. AK, KM, CG and RG performed data acquisition. CG, MH and SM performed data analysis and interpretation. CG, AK, KM, RG, SM, SS, MH and JB were responsible for manuscript preparation. MH and CG performed statistical analysis.

The literature base is very limited regarding AC and SLE, and no RCTs have been published. A case series of 15 patients with discoid lupus receiving auriculo-acupuncture (needling of ear acu-points) reported an 87% rate of improvement in cutaneous lesions.⁸ A case series by Feng, *et al.*⁹ in Shanghai used standardized sets of AC points on 25 SLE patients and found improvement on joint pain, fatigue and skin rashes in 80% of patients as determined by physical examination. Participants in the Feng, *et al.* study received one or more sets of 10 sessions depending on treatment response, with two sets reported as the modal treatment length. The results of these case series are promising, but both studies had serious methodological issues. For instance, treatment length was not standardized, no comparison groups, such as usual care alone or sham AC, were included, and neither study had blinded assessments.

This pilot investigation is the first RCT of AC for SLE as well as the first AC trial in SLE at our institution, a large allopathic university hospital system. Thus, we needed to determine the willingness of SLE patients to participate in a pilot study of AC. The aims of this pilot study were to evaluate the feasibility and safety of a standardized 10-session AC plus usual medical care protocol designed to reduce pain and fatigue in patients with SLE, and to explore pre- to post-treatment changes.

Patients and methods

Research study design overview

This pilot feasibility study was designed as a modified double-blind, RCT of AC as an adjunct to usual medical care, a minimal needling (MN) control procedure plus usual medical care and usual medical care alone (UC) for pain and fatigue related to SLE. The study design is a 1-between (AC vs. MN vs. UC), 1-within (time: pre- and post-treatment) completely balanced design. Potential subjects were pre-screened via telephone, and if eligible and interested underwent a pre-treatment evaluation with a rheumatologist and completed laboratory studies and questionnaires. Those randomized to AC and MN completed 10 treatment sessions over approximately 5 weeks, in addition to usual care. Following the course of AC or MN, participants underwent post-treatment evaluation procedures, including rheumatology examination, laboratory studies and questionnaires. Those assigned to UC completed the post-treatment evaluation approximately 6–7 weeks following their initial study entry visit, consistent with the pre-post interval of AC and MN participants. All outcome assessments were made by staff blinded to treatment group.

Subjects

Participants were recruited via flyers posted in examination rooms at the Lupus Center of Excellence out-patient facility at the University of Pittsburgh Medical Center, and through a mailing to members of the Pittsburgh Lupus Registry, which at the time of recruitment (November 2004 to January 2006) included 247 living persons meeting ACR 1997 revised criteria for SLE,¹⁰ who had been seen within the past year.

Potential participants meeting minimum eligibility criteria upon telephone interview were invited to the pre-treatment study evaluation at the University of Pittsburgh General Clinical Research Center. Prior to this initial study evaluation, all participants completed informed consent procedures approved by the Institutional Review Board of the University of Pittsburgh.

Inclusion criteria

Eligibility criteria included: (i) patients meeting the 1997 revised criteria for SLE (10); (ii) 18 years of age; (iii) pain duration of at least 3 months, with pain reported at least three

times per week; (iv) medications and doses stable for at least 1 month and (v) able to speak, read and understand English and provide informed consent.

Exclusion criteria

Potential participants were excluded due to: (i) known pregnancy, because pregnancy hormones can alter pain experience; (ii) active uncontrolled severe organ involvement, as this could interfere with research study adherence and most likely require therapeutic interventions that could alter study results; (iii) pred-nisone dose >10 mg/day; (iv) platelets <100,000, to decrease the risk of bleeding at AC sites and (v) recent AC treatment, defined as three or more sessions within the past 2 years.

Randomization and blinding procedures

Random group assignments were computer-generated using permuted block randomization with block sizes of 6. Subjects were randomized with equal allocation to one of three arms: AC, MN and UC. Assignment was carried out via sealed, numbered and opaque envelopes at the end of pre-treatment evaluations. Those assigned to AC or MN were kept blinded to which treatment they received. Neither the evaluating rheumatologist nor the research associate who collected questionnaires was aware of treatment assignment. The physician-acupuncturist who conducted the treatment was blind to pre- and post-treatment evaluation data. The study staff advised AC and MN participants of their group assignment after the post-treatment evaluation.

Interventions

A physician and certified acupuncturist (RG) provided the majority of AC and MN treatments, with some treatments provided by a licensed acupuncturist who was also trained and calibrated in the AC and MN protocols. Acupuncturists participated in calibration sessions every 4–6 months during the study to maintain standard technique. A research assistant who did not participate in outcome assessments observed all AC sessions to ensure protocol adherence as well as document safety. All AC and MN sessions took place at the Center for Integrative Medicine at the University of Pittsburgh Medical Center.

Acupuncture protocol—We based our AC protocol on the acu-points used by Feng, *et al.* (1985). We modified and standardized the protocol by (i) limiting treatment to 10 sessions over 5 weeks and (ii) including electrical stimulation to paraspinal points using a PENS 4c electro stimulator (Pantheon Research, Venice, California, USA). Sterile disposable needles (32-gauge) 30–40 mm in length were inserted to a depth sufficient to produce a needling sensation (De Qi). Needling sensation or De Qi is typically described as a dull ache, heavy sensation or non-painful throbbing sensation. Two sets of AC points were used on alternating treatment sessions. In each session, seven or eight paraspinal points were stimulated via PENS at a frequency of 2 Hz and moderate intensity as tolerated by the participant. Additionally, the arm and leg AC points were stimulated manually each 10 min as per Feng, *et al.*⁹ All needles were left in place for 30 min. The specific AC points are depicted in Figure 1 and noted in the following list: ‘first set of AC points’ includes paraspinal points called Hua Tuo Jai Ji points at thoracic levels T-3, T-7, T-11, as well as the points LI-4, GV-14, KI-7 and SP-6. ‘Second set of AC points’ includes Hua Tuo Jai Ji points at T-5, T-9 and L-1 levels, and GB-20, MH-5 and ST-36.

Minimal needling protocol—Minimal needling, which involves shallow insertion of needles on body areas that are not known to correspond to AC points, was the control intervention. Each MN participant received the intervention twice weekly for 5 weeks (10 sessions). Acupuncture needles were inserted below the skin’s surface to an insufficient

depth to elicit a needling sensation or De-Qi. Eight needles were inserted in areas that are not known to correspond to classical AC points or specific neuro-vascular structures. The MN areas included bilateral points on the scapulae (medial aspect, just inferior to scapular spine), gluteus maximus (posterior-lateral aspect, approximately 2 cm below the iliac crest on a line from the L5 spinal process and the anterior superior iliac spine), forearm (posterior medial forearm approximately 4 cm distal to the medial epicondyle) and leg (posterior leg over the midpoint of lateral head of gastrocnemius). The needles in scapular and gluteal locations were connected to the PENS electro-acupuncture unit. No electrical stimulation was provided, but the indicator light on the stimulator was lit as if stimulation was being delivered. The needles remained in place for 30 min.

The subjects in AC and MN groups were informed that they may or may not perceive a pulsing sensation with the AC. During the entire study, AC and MN subjects continued their usual medical care.

UC protocol—Usual medical care for individuals with SLE varies depending on clinical features. However, daily doses of corticosteroids (2–10 mg) and anti-inflammatory medicines are common. Subjects in this condition continued with their usual medical care, and participated in the two medical /psychosocial evaluations, occurring approximately 6–7 weeks apart, corresponding to the pre- and post-treatment evaluations received by the AC and MN subjects. In order to enhance subjects' motivation to remain in the study, two AC sessions were offered at no cost to UC subjects following their post-treatment evaluation.

Measures

Pain and fatigue measures—Study participants completed standardized questionnaires at the pre- and post-treatment evaluations. 'Pain' was assessed by several validated and reliable instruments. The Arthritis Impact Measurement Scales- revised Pain Scale (AIMS2-Pain)^{11,12} consists of five averaged items that assess frequency and severity of pain and stiffness. The brief version of the Pain Severity and Interference scales from the Multidimensional Pain Inventory (MPI)^{13,14} assesses past week pain severity and interference with activities due to pain, in four items. The Bodily Pain scale of the SF-36 Health Survey version 2 (SF-36 BP)¹⁵ assesses pain severity and interference in two items. Two measures of 'Fatigue' were obtained. The Fatigue Severity Scale (FSS)¹⁶ is a nine-item scale that assesses the effect of fatigue on various daily activities. The 4-item Vitality scale of the SF-36 v 2 Health Survey (SF-36 VT) was collected as an additional measure of fatigue.

SLE disease measures—Validated measures of SLE disease activity and cumulative damage due to SLE were obtained at study entry visit by one of two rheumatologists specializing in SLE (AK or KM). Disease activity measures were also obtained during the post-treatment evaluation. The Systemic Lupus Activity Measure-Revised (SLAM-R)¹⁷ assesses disease activity and severity over the past month by physician interview, examination and laboratory tests. The SLE Disease Activity Index (SLEDAI)¹⁸ contains 24 descriptors in nine organ systems, and includes clinical and laboratory measures of SLE disease activity over the past 10 days. The cytokines interleukin-1 beta (IL-1B) and IL-6 were assayed from serum using ELISA (R&D Systems, Minneapolis, Minnesota, USA), as additional markers of inflammation associated with SLE disease and fatigue.¹⁹ Cumulative damage caused by SLE was assessed at the study entry visit using the SLICC/ACR Damage Index.²⁰

Feasibility, adherence, safety and treatment expectations—Feasibility of recruitment to the study was assessed as proportion of eligible to interested persons, and

feasibility of the protocol was assessed as proportion completing to persons initiating treatment. An adherence standard of 80% of AC or MN sessions attended as scheduled, without no-shows or cancellations, was set as acceptable feasibility. A research assistant documented safety of AC and MN on a standard checklist following each session. This checklist contained typical transient side effects, such as needling pain on insertion, local bruising, local bleeding (i.e. one drop) and brief dizziness or lightheadedness, as well as minor adverse events, such as nausea, fainting, persistent dizziness (>5 min), and localized infection. The checklist included a listing of serious adverse AC events, such as needle breakage, prolonged bleeding and pneumothorax. Following the first and tenth sessions, AC and MN subjects rated their expectations of their treatment using a 5-item treatment credibility scale frequently utilized in treatment outcome studies.²¹ These participants also were asked to guess which treatment they were receiving, as well as their confidence in the guess, to determine the credibility of the MN control condition.

Data analysis

Baseline characteristics of the three groups (AC, MN and UC) and credibility ratings of AC and MN were compared using *t*-tests in the case of normally distributed continuous variables, and using non-parametric tests (e.g. Kruskal–Wallis χ^2) in cases of non-normality. Fisher's Exact test was used for categorical or dichotomous variables. SPSS version 13 (SPSS, Inc., Chicago, Illinois, USA) was used for these analyses. The mean imputation method²² was used for missing data.

The aims of this pilot study were to evaluate feasibility and safety, and to explore treatment effects; thus the analyses are primarily descriptive. We compiled data on feasibility of recruitment, adherence to the study protocols and safety of the protocols as described above. Due to the small sample size planned for this pilot, we used descriptive methods rather than inferential statistics to explore potential treatment effects. To explore treatment effects descriptively, we used two approaches. We computed effect size estimates (Cohen's *d*)²³ using change scores in outcome measures for each group. An effect size of 0.2 is considered to be a small effect, 0.5, a medium effect and 0.8, a large treatment effect.²³ Moreover, for an estimate of clinical utility, we counted the number of participants obtaining 30% improvement on pain and fatigue measures that are frequently used in rheumatology research (AIMS2, SF36 Bodily Pain and SF36 Vitality).

Results

Feasibility of recruitment

The recruitment goal of 24 participants was met, and randomization resulted in comparable groups, generally. Fifty-two persons with SLE responded to recruitment mailings and posters. After pre-screening via telephone, 24 (46%) of the 52 were eligible and interested in enrolling. Reasons for ineligibility or refusal are delineated on the trial profile (Figure 1). Demographic characteristics for participants in each of the randomly assigned treatment groups are presented in Table 1. The three groups were comparable on education level, age and employment status. However, the groups differed on SLICC/ACR Damage Index ($P=0.024$), with the UC group exhibiting greater cumulative damage due to SLE. The group difference is influenced by two individuals in this group having damage indices of 10 and 11 points.

Subject retention and adherence

Nearly all patients completed the study and adhered to treatments as scheduled. The 24 participants were assigned randomly to AC, MN or UC. Of the 16 assigned to receive either MN or AC, 14 completed all 10 sessions, while two patients, both assigned to MN, dropped

out of treatment after the second AC session. One of these individuals cited time constraints as her reason for dropping out, however, she did complete all post-intervention evaluation procedures, and her scores were included in computation of effect size estimates. The other individual was hospitalized for a recurrence of her longstanding cardiovascular disease and elected not to continue the study. Post-treatment scores for this individual were imputed for effect size estimation using the MN group average.²² The overall completion rate for this pilot study is 22/24 or 92%, and the completion rate for those assigned to MN or AC sessions is 14/16 or 87.5%. Of the 14 AC and MN participants who completed the programme, 13 (93%) of these completed all of their 10 sessions in 6 weeks or less (mode = 5 weeks) and the other completed within 7 weeks. 86% of the treatment completers (12 of the 14 assigned to MN or AC who completed treatment) met the adherence standard of at least 80% of sessions attended as scheduled. The two participants, who did not meet the 80% adherence standard had adherence rates of 70% and 60% of sessions attended as scheduled.

Safety of acupuncture: adverse events and side effects

No serious side effects or adverse events were found. However, minor transient side effects of AC were reported by 6/8 (75%) of the AC group and 4/6 (67%) of the MN completing participants. These consisted of: pain during needle insertion (six participants), dizziness or lightheadedness (three participants), local bruising (three participants). One reported transient bleeding. There was one report of muscle soreness following the AC, and one report of low-grade fever lasting <1 h. Based upon interview following each session with each participant, a total count of 33 side effects were reported across 144 sessions, for a side effect rate of 23%. For one AC participant with low body mass, the acupuncturist elected to use finer gauge needles.

Credibility of AC and MN to participants

The AC and MN treatments were credible, and blinding was successful. The participants' average credibility ratings of the AC and MN treatments after the first treatment session were 4.9 and 5.1 on a 6-point scale for AC and MN, respectively, and not significantly different from one another at either the first ($P = 0.54$) or the final ($P = 0.07$) session. To assess blinding, participants were asked which treatment they had received. After the first session, 1/8 (12.5%) of the MN participants and 4/8 (50%) of the AC group correctly guessed the type of AC they had received ($P = 0.14$). The majority of participants (75% of each group) indicated that their choice was a random guess. By the 10th session, 67% of MN and 57% of AC participants correctly guessed which treatment they had been receiving ($P = 0.38$), with 50% (MN) and 57% (AC) indicating that their rating was a random guess.

Exploration of treatment effects

AC and MN may benefit some patients, particularly for pain reduction. Prior to treatment, the three treatment groups did not differ from one another on pain, fatigue and SLE disease activity (Table 2). At baseline, only IL-1B concentration levels were different among the groups ($P = 0.02$) with highest IL-1B levels in the UC group. Table 3 shows pre-post change score mean and standard deviation values for outcome measures for each group. Change scores for pain and fatigue were in the direction of improvement in both the AC and MN groups. For disease activity (SLAM-R) and inflammatory cytokines, UC and MN change scores, but not AC, were in the direction of improvement. As indicated by the standard deviations of the mean changes, there was a great deal of variability in the change scores among the participants.

Effect size estimates (Table 3) for AC compared with UC were in the small to medium range²³ for pain and fatigue. Effect size estimates for AC relative to MN were small or null,

and for some variables, MN had greater effect than AC. In the area of disease activity, effect size estimates were generally small and favouring UC. A large effect, favouring UC, was seen for IL-1B change for AC relative to UC. For change in IL-6, large effect size estimates were found for both AC and MN in comparison to UC, most likely because of increased concentration of this inflammatory cytokine in the UC group.

We assessed clinical improvement in pain and fatigue, defined as 30% or greater reduction in symptoms on AIMS2 pain or SF36 bodily pain, and SF36 vitality scale respectively. Approximately 40% of AC and MN, but no UC subjects, improved on their pain scores. Clinical improvement in fatigue was less striking, with 13% and 25% of AC and MN reporting greater vitality, whereas no UC participants met the improvement standard.

Discussion

This pilot study demonstrates that a 10-session AC protocol is feasible and safe for persons with SLE. Not only were people with lupus interested in AC, but also nearly all who enrolled completed the 10 sessions as scheduled. No adverse events were associated with the AC interventions in this study, although two-thirds of participants reported transient mild side effects, such as brief needling pain, lightheadedness or local bruising.

A secondary aim of this pilot study was to explore effects of AC on pain and fatigue. Compared with UC, both AC and MN may reduce pain. This is supported by the small to medium effect size estimates obtained, as well as the percentage of AC and MN patients with clinical improvement. Fatigue reduction was also supported, but fewer patients attained clinical improvement on fatigue. Acupuncture was associated with a small benefit over MN on one pain severity measure and one fatigue severity measure. However, in general, the effect sizes and clinical benefits of AC and MN were comparable to one another. Although this pilot study did not have the appropriate sample size and power to determine statistical significance of treatment benefits, these exploratory results suggest potential usefulness of AC as a non-pharmacological method for managing pain and potentially fatigue in SLE patients.

The absence of serious adverse events in this study is consistent with other AC investigations,²⁴⁻²⁶ but transient side effects were somewhat higher than that is typically reported. Because of the relative lack of AC investigations in lupus, our intent was to carefully document all side effects on a session by session basis, and a side effect rate of 0.23 (23%) was found. In contrast, two large-scale prospective survey studies found the incidence of minor side effects of AC to be 671/10,000 or 0.67%,²⁴ and mild transient reactions in 5136 of 34,407 sessions or 15%,²⁵ based upon weekly mailed questionnaires. Acupuncture side effects are not typically listed in clinical trials.^{3,4,27} Therefore, it is difficult to compare the side effects in this lupus trial to those in other rheumatologic conditions. None of the side effects in the current pilot required any additional intervention, and side effects did not deter subjects from adherence to the protocols. Therefore, we consider that subject safety was not compromised.

Our finding of no major benefit of AC over MN at non-AC points is consistent with other studies^{3,28} and may reflect the nonspecific analgesic effect of needle penetration. A study of AC for knee osteoarthritis (OA)³ in 1007 patients found that approximately 50% of patients showed >39% improvement on WOMAC scores after AC plus physiotherapy and after MN on non-AC points plus physiotherapy. One additional study of AC plus diclofenac for knee OA used non-penetrating needles as a control condition.⁶ The true AC led to significantly greater improvement in WOMAC function. Another large ($n = 570$) knee OA study⁴ used a control condition that combined two minimally inserted and several non-inserted needles.

After 8 weeks of treatment, the two groups did not differ on WOMAC pain and function improvement, but after 26 weeks, true AC was superior to control. The knee OA studies, and our own pilot, could be interpreted in several ways. Minimal needling may produce a placebo response in participants, or it may elicit nonspecific analgesic response (i.e. MN is not an inert treatment). Alternatively, a longer treatment course of true AC may be needed in order for benefits over MN to be observed.

The current pilot's strengths are low attrition rate, adequate blinding, careful assessment of side effects throughout treatment and observation of all treatment sessions to ensure acupuncturists' adherence to protocols. There are certain limitations inherent in any pilot study. The current study is limited by the small sample size, fairly brief treatment length and lack of long-term follow-up. Our small sample size contributes to low power for detecting group differences in response to AC. The small sample size may be particularly problematic in a disease such as SLE, which is characterized by natural fluctuation in symptoms and variability in manifestations. With a small sample and a highly variable disease, it is likely that randomization will result in baseline differences on one or more measures. In this study, cumulative damage was greater in the UC group, as was IL-1B. Additionally, baseline SLEDAI was higher for some UC patients. These baseline differences are a limitation and may have affected results in terms of disease activity and inflammation. Baseline differences should be controlled statistically in larger studies aimed at testing group differences. With recognition that statistical tests were not appropriate in this small study, our exploration of treatment effects included effect size estimates, which are independent of sample size, and proportions of persons obtaining clinical benefit. Acupuncture benefits over usual care are supported by effect size estimates for pain and fatigue, as well as numbers of patients with clinical improvement in pain. The relatively brief treatment length and follow-up were chosen, because the main study aims were to evaluate safety and feasibility. A brief (six sessions) AC for fibromyalgia trial found benefit for pain and stiffness compared with MN control.⁷ Other studies of AC for rheumatologic diseases support the utility of longer treatment length and tapering treatment.^{3,4,9} For example, the electroacupuncture protocol of Berman, *et al.*,⁴ tapered treatment from twice per week to once per month over a total of 26 weeks of treatment for OA of the knee. The benefits of AC in the present pilot may have been limited due to less than adequate dose of AC. However, the proportions of patients with pain reduction benefits in our brief treatment approached those found in larger, longer knee OA trials.

In summary, a brief course of AC appears feasible and safe for patients with lupus. Common side effects, such as needling pain and lightheadedness, did not deter participants from continuing the interventions. The estimates of effect sizes and number of clinical responders suggest that AC may be a useful non-pharmacological method for managing pain for patients with lupus in addition to usual medical care.

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References

1. Moore AD, Petri MA, Manzi S, et al. The use of alternative medical therapies in patients with systemic lupus erythematosus. Trination Study Group. *Arthritis Rheum.* 2000; 43:1410–1418. [PubMed: 10857802]
2. Ghoname EA, Craig WF, White PF, et al. [see comment][erratum appears in *JAMA* 1999 May 19; 281: 1795] Percutaneous electrical nerve stimulation for low back pain: a randomized crossover study. *JAMA.* 1999; 281:818–823. [PubMed: 10071003]
3. Scharf H, Mansmann U, Streitberger K, et al. Acupuncture and knee osteoarthritis. *Ann Intern Med.* 2006; 145:12–20. [PubMed: 16818924]
4. Berman BM, Lao L, Langenberg P, Lee WL, Gilpin AMK, Hochberg M. Effectiveness of acupuncture as adjunctive therapy in osteoarthritis of the knee. *Ann Intern Med.* 2004; 141:901–910. [PubMed: 15611487]
5. Berman B, Singh BB, Lao L, et al. A randomized trial of acupuncture as an adjunctive therapy in osteoarthritis of the knee. *Rheumatology.* 1999; 38:346–354. [PubMed: 10378713]
6. Vas J, Mendez C, Perea-Milla E, et al. Acupuncture as a complementary therapy to the pharmacological treatment of osteoarthritis of the knee: randomised controlled trial. *BMJ.* 2004; 329:1216. [PubMed: 15494348]
7. Deluze C, Bosia L, Zirbs A, Chantraine A, Vischer TL. [see comment] Electroacupuncture in fibromyalgia: results of a controlled trial. *BMJ.* 1992; 305:1249–1252. [PubMed: 1477566]
8. Chen Y, Hu X. Auriculo-acupuncture in 15 cases of discoid lupus erythematosus. *J Tradit Chin Med.* 1985; 5:261–262. [PubMed: 3834238]
9. Feng SF, Fang L, Bao GQ, et al. Treatment of systemic lupus erythematosus by acupuncture. A preliminary report of 25 cases. *Chin Med J.* 1985; 98:171–176. [PubMed: 3924508]
10. Hochberg MC. [see comment] Updating the American College of Rheumatology revised criteria for the classification of systemic lupus erythematosus. *Arthritis Rheum.* 1997; 40:1725. [PubMed: 9324032]
11. Meenan RF, Gertman PM, Mason JH. Measuring health status in arthritis. The arthritis impact measurement scales. *Arthritis Rheum.* 1980; 23:146–152. [PubMed: 7362665]
12. Meenan RF, Gertman PM, Mason JH, Dunaif R. The arthritis impact measurement scales. Further investigations of a health status measure. *Arthritis Rheum.* 1982; 25:1048–1053. [PubMed: 7126289]
13. Kerns RD, Turk DC, Rudy TE. The West Haven-Yale Multidimensional Pain Inventory (WHYMPI). *Pain.* 1985; 23:345–356. [PubMed: 4088697]
14. von Korff, M. Epidemiologic and survey methods: chronic pain assessment. New York: Guilford Press; 1992.
15. Ware, JE.; Kosinski, M.; Dewey, JE. How to score version 2 of the SF-36 Health Survey. Lincoln, RI: QualityMetric Incorporated; 2000.
16. Krupp LB, LaRocca NG, Muir-Nash J, Steinberg AD. The fatigue severity scale. Application to patients with multiple sclerosis and systemic lupus erythematosus. *Arch Neurol.* 1989; 46:1121–1123. [PubMed: 2803071]
17. Liang MH, Socher SA, Larson MG, Schur PH. Reliability and validity of six systems for the clinical assessment of disease activity in systemic lupus erythematosus. *Arthritis Rheum.* 1989; 32:1107–1118. [PubMed: 2775320]
18. Bombardier C, Gladman DD, Urowitz MB, Caron D, Chang CH. Derivation of the SLEDAI. A disease activity index for lupus patients. The Committee on Prognosis Studies in SLE. *Arthritis Rheum.* 1992; 35:630–640. [PubMed: 1599520]
19. Mok CC, Lau CS. Pathogenesis of systemic lupus erythematosus. *J Clin Pathol.* 2003; 56:481–490. [PubMed: 12835292]
20. Gladman DD, Urowitz MB, Goldsmith CH, et al. The reliability of the Systemic Lupus International Collaborating Clinics/American College of Rheumatology Damage Index in patients with systemic lupus erythematosus. *Arthritis Rheum.* 1997; 40:809–813. [PubMed: 9153540]
21. Borkovec TD, Nau SD. Credibility of analogue therapy rationales. *J Behav Ther Exp Psychiatry.* 1972; 3:257–260.

22. Little, RJA.; Rubin, DB. Statistical Analysis with Missing Data. 2. New York: John Wiley; 2002.
23. Cohen, J. Statistical power for the behavioral sciences. 2. Hillsdale, NJ: Lawrence Erlbaum; 1988.
24. White A, Hayhoe S, Hart A, Ernst E. Adverse events following acupuncture: prospective survey of 32,000 consultations with doctors and physiotherapists. Br Med J. 2001; 323:485–486. [PubMed: 11532840]
25. MacPherson H, Thomas K, Walters S, Fitter M. The York acupuncture safety study: prospective survey of 34,000 treatments by traditional acupuncturists. Br Med J. 2001; 323:486–487. [PubMed: 11532841]
26. NIH Consensus Conference: acupuncture. JAMA. 1998; 280(17):1518–1524. [PubMed: 9809733]
27. Schlay J, Chaloner K, Max MB, et al. Acupuncture and amitripty-line for pain due to HIV-related peripheral neuropathy. J Am Med Assoc. 1998; 280:1590–1595.
28. Naslund J, Naslund U, Odenbring S, Lundeborg T. Sensory stimulation (acupuncture) for the treatment of idiopathic anterior knee pain. J Rehabil Med. 2002; 34:231–238. [PubMed: 12392239]

Figure 1.
Trial profile.

Table 1

Participant demographics, by group*

	AC (<i>n</i> = 8)	MN (<i>n</i> = 8)	UC (<i>n</i> = 8)	<i>P</i> -value
Age, mean $\pm$ SD	43.1 $\pm$ 10.1	51.0 $\pm$ 4.9	50.6 $\pm$ 8.4	0.10
SLE Damage Index, mean $\pm$ SD	3.8 $\pm$ 2.4	3.6 $\pm$ 0.9	7.3 $\pm$ 4.0	0.02
Female, <i>n</i> (%)	8 (100)	8 (100)	7 (88)	1.0
Race/ethnicity, <i>n</i> (%)				
White	7 (88)	7 (88)	6 (75)	0.49
African-American	0	1 (12)	2 (25)	
Hispanic	1 (12)	0	0	
Education, Mean years $\pm$ SD	15.4 $\pm$ 1.8	14.5 $\pm$ 2.6	15.4 $\pm$ 3.9	0.79
Employment status, <i>n</i> (%)				
Currently working	3 (37)	2 (25)	2 (25)	0.82
Stopped work due to illness	5 (63)	4 (50)	5 (63)	
Stopped work for other reasons	0	2 (25)	1 (12)	

Abbreviations: AC: acupuncture plus usual medical care; MN: minimal needling plus usual medical care; UC: usual medical care alone.

Table 2

Baseline pain, fatigue and SLE disease characteristics by group*

	AC (n = 8)			MN (n = 8)			UC (n = 8)		
	Mean	Range		Mean	Range		Mean	Range	P-value
Pain									
AIMS2 pain	2.3	1.2–3.6		2.2	0.6–3.6		2.0	0–3.6	0.85
MPI–Interference	6.3	1.5–10		4.3	1–10		5.4	1–8.5	0.36
MPI–Severity	6.1	2.5–8		4.3	1.5–9		5.1	2–6.5	0.33
SF-36 bodily pain [/]	33.7	24.9–46		39.4	24–50.3		36.3	28.7–50.3	0.41
Fatigue									
FSS	4.4	3.2–5.8		4.2	2.3–5.4		4.3	0.7–5.8	0.91
SF-36 vitality [/]	40.8	27–52		41.2	30.2–58.3		38.8	24–67.7	0.92
Disease activity									
SLAM-R	6.1	4–11		6.5	4–10		8.5	2–17	0.66
SLEDAI	2.6	0–11		2.6	0–6		5.3	0–12	0.33
Physician's global rating	7.8	0–25		7.3	2–19		9.8	0–27	0.77
Cytokines									
IL-1B (pg/ml)	0.19	0.11–0.37		0.27	0.14–0.45		0.42	0.18–1.0	0.02
IL-6 (pg/ml)	1.2	0.37–2.3		1.2	0.41–2.6		2.4	0.74–7.9	0.16

Abbreviations: AC: acupuncture plus usual care; MN: minimal needling plus usual care; UC: usual care only; AIMS2 Pain: Arthritis Impact Measurement Scales version 2 Pain scale; MPI–Interference: Brief version of Multidimensional Pain Inventory–Interference scale; MPI–Severity: Brief version of Multidimensional Pain Inventory–Pain Severity scale; SF-36 Bodily Pain: SF-36 Health Survey version 2 Bodily Pain scale; FSS: Fatigue Severity Scale; SF-36 Vitality: SF-36 Health Survey version 2 Vitality scale; SLAM-R: Systemic Lupus Activity Measure–Revised; SLEDAI: SLE Disease Activity Index; Physician's Global Rating: Physician's global rating of disease activity; IL-1B: interleukin-1 beta; IL-6: interleukin 6.

[/] Higher scores on SF-36 measures indicate better health, whereas higher scores on other measures indicate worse health.

Table 3

Change scores and effect size estimates for outcome measures by group*

	AC			MN		UC		Effect size estimates ¹	
	Post-pre mean (SD)	Post-pre mean (SD)	Post-pre mean (SD)	Post-pre mean (SD)	Post-pre mean (SD)	Post-pre mean (SD)	AC vs. UC	AC vs. MN	MN vs. UC
Pain									
AIMS2 pain	-0.25(1.2)		-0.49(0.85)		0.33(0.68)		0.60	[0.23]	1.0
MPI-Interference	-1.1(2.3)		-0.71(1.7)		-0.19(1.7)		0.47	0.19	0.30
MPI-Pain Severity	-1.3(2.1)		-0.57(2.7)		0 (2.2)		0.57	0.30	0.22
SF-36 bodily pain ²	3.0(9.5)		2.7(6.4)		0.58(5.0)		0.31	0.04	0.35
Fatigue									
FSS	-0.35(0.88)		-0.1(0.88)		-0.06(1.1)		0.29	0.28	0.04
SF-36 vitality ²	1.6(8.0)		4.0(9.1)		-0.78(7.2)		0.31	[0.28]	0.56
Disease activity									
SLAM-R	0.63(4.6)		-0.57(3.9)		-0.63(6.7)		[0.22]	[0.28]	[0.01]
SLEDAI	1.9(7.2)		1.6(4.1)		0.75(8.3)		[0.15]	[0.05]	[0.12]
Physician's global rating	0.0(14.8)		-1.4(5.6)		0.38(11.1)		0.03	[0.13]	0.20
Cytokines									
IL-1B	0.08(0.08)		-0.03(0.09)		-0.04(0.11)		[1.09]	[1.3]	[0.08]
IL-6	0.09(0.68)		-0.38(0.67)		1.9(3.4)		0.73	[0.70]	0.92

Abbreviation: SD: standard deviation.

¹ Effect size estimates are based on change score differences between treatment groups, divided by pooled standard deviation. Effect size differences in brackets indicate that, contrary to expectation, the effect was in the direction of greater improvement among UC than AC or MN, and greater improvement in MN relative to AC.

² Positive change scores indicate improvement on SF-36 measures, whereas negative change scores indicate improvement on other measures.