Rheumatology 2007;46:384–390
Advance Access publication 10 January 2007
doi:10.1093/rheumatology/kel413

Review

Acupuncture treatment for chronic knee pain: a systematic review

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Objectives. To evaluate the effects of acupuncture on pain and function in patients with chronic knee pain.
Methods. Systematic review and meta-analysis of randomized controlled trials of adequate acupuncture. Computerized databases and reference lists of articles were searched in June 2006. Studies were selected in which adults with chronic knee pain or osteoarthritis of the knee were randomized to receive either acupuncture treatment or a control consisting of sham (placebo) acupuncture, other sham treatments, no additional intervention (usual care), or an active intervention. The main outcome measures were short-term pain and function, and study validity was assessed using a modification of a previously published instrument.
Results. Thirteen RCTs were included, of which eight used adequate acupuncture and provided WOMAC outcomes, so were combined in meta-analyses. Six of these had validity scores of more than 50%. Combining five studies in 1334 patients, acupuncture was superior to sham acupuncture for both pain (weighted mean difference in WOMAC pain subscale score = 2.0, 95% CI 0.57–3.40) and for WOMAC function subscale (4.32, 0.60–8.05). The differences were still significant at long-term follow-up. Acupuncture was also significantly superior to no additional intervention. There were insufficient studies to compare acupuncture with other sham or active interventions.
Conclusions. Acupuncture that meets criteria for adequate treatment is significantly superior to sham acupuncture and to no additional intervention in improving pain and function in patients with chronic knee pain. Due to the heterogeneity in the results, however, further research is required to confirm these findings and provide more information on long-term effects.

KEY WORDS: Acupuncture, Systematic review, Meta-analysis, Chronic knee pain, Osteoarthritis, WOMAC, Function.

Introduction

Knee pain affects about a quarter of people older than 55 yrs, and is severe enough to restrict normal daily activities in about half of these [1, 2]. After excluding specific conditions such as inflammatory arthritis, much of this pain is given the label of 'osteoarthritis' (OA). The clinical problem of OA embraces a wide group of older adults with knee pain, and will include a subgroup of patients who have radiographic changes in the relevant joints as well as a clinical syndrome of pain, stiffness and restricted movement [3]. There are divided opinions within the literature about the use of radiology and the importance of separating the disease process of OA from the syndrome of musculoskeletal pain and disability [4, 5]. The main treatment priorities that have been identified by both patients with arthritis and clinicians are pain relief and improved mobility [6, 7].

Pharmacological therapies have limited appeal: the effects of non-steroidal anti-inflammatory drugs are small and short-lived [8], and their use is associated with serious side effects including bleeding and perforated ulcer [9]. Cyclooxygenase-2 inhibitors were introduced with the hope of reducing the incidence of gastro-intestinal side effects, but they may not be successful at this, and seem to increase the risk of cardiovascular disease [10].

Non-pharmacological therapies for knee arthritis are therefore increasingly attractive and are included in current recommendations for treatment [11]. Acupuncture, one of the most commonly used of these [12, 13], may be considered a form of sensory stimulation, and its use for relieving pain is supported by evidence of biological mechanisms for its effects [14, 15]. However, until recently there has been insufficient evidence of its clinical effectiveness to formally consider integrating acupuncture within the health service [16].

A previous review of seven trials of acupuncture for knee pain associated with OA reported that acupuncture might play a role in treatment, but its conclusions were limited by the poor quality of the majority of studies [17]. Several more trials have recently been published [18–21] and it is therefore timely to reconsider the question of whether acupuncture reduces pain and improves physical function in patients with chronic knee pain, compared with placebo/sham treatment, no treatment and conventional treatment.

Methods

We undertook a systematic review and meta-analysis of the evidence from randomized controlled trials on acupuncture's effect in reducing pain and increasing function in patients with chronic knee pain.

We have conducted this review using a Western scientific approach to acupuncture, viewing it as a form of sensory nerve stimulation. According to this approach, acupuncture's effect will depend on the stimulation intensity, frequency and repetition, and the neurological level at which it is given; the precise location of needles may not be important [22]. This approach provides a basis for defining the adequacy of acupuncture and placebo interventions. From clinical experience and empirical data [23, 24] we defined acupuncture as 'adequate' if it consisted of at least six treatments, at least one per week, with at least four points needled for each painful knee for at least 20 min, and either needle sensation (*de qi*) achieved in manual acupuncture, or electrical stimulation of sufficient intensity to produce more than minimal sensation. We defined a control as a 'true sham' only when it avoided stimulating nerves in the same neurological segments as the knee joint; even superficial penetration with needles is regarded as unacceptable because it has the potential to be physiologically active [25].

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Submitted 4 July 2006; revised version accepted 7 November 2006.

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Search

A search was conducted of Medline, Embase, Cochrane CENTRAL, AMED, CINAHL and PEDro computerized databases in June 2006 using the terms acupuncture, electro-acupuncture, percutaneous electrical nerve, percutaneous neuromodulation together with knee, gonarthritis and pain, osteoarthritis/osis and randomized, controlled, comparative, sham, placebo or blind, using appropriate wildcards. We also wrote to first authors of four recent studies and seven authors of current trials identified through the Controlled Trials Register, seeking any additional publications. Studies were included in any language that we could translate—French, German, Greek, Italian and Spanish. Asian databases were not accessed because of insufficient resources, but we believe that this omission would have a conservative effect on our results since published Chinese studies of acupuncture are largely or invariably positive [26].

Each title and abstract was reviewed by at least two authors, and a copy of the report of any study that appeared to be an RCT was retrieved and translated if necessary. In addition, the reference lists of previous reviews and all studies retrieved were scanned for further possible studies.

Study selection

Two authors independently selected randomized studies for inclusion using four criteria: the participants were adults who had either chronic knee pain on most days for at least 3 months, or a diagnosis of osteoarthrosis or OA of the knee with radiological confirmation; the intervention was a course of body acupuncture treatment defined as the insertion of solid needles into the body for therapeutic purposes; the comparison group(s) received either sham acupuncture, other sham treatment, no additional intervention (i.e. usual care), or an active intervention; and the outcomes included pain or function, measured with any instrument.

We excluded studies in post-operative knee pain, where different forms of active acupuncture were compared, where 'laser acupuncture' or electrical stimulation without needles was given, or where no data were reported. We did not limit the studies to particular settings.

Data extraction

Two authors extracted data independently, using piloted spreadsheets, on each study's characteristics, number of subjects included at each measurement point, outcomes and quality, resolving disagreements (<1% of entries) by discussion. Full translation was obtained for studies not published in English.

Outcomes extracted were pain and function. For pain, we used the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) subscale for pain (range 0–20); we converted mean scores presented in other scales into 0–20 scales. For function, we used the WOMAC subscale for functional impairment (range 0–68), converting data presented as WOMAC VAS. No other functional scales used were judged to be acceptable as equivalent to WOMAC. WOMAC's psychometric properties have been extensively studied in knee pain populations [27] and its use in trials recommended [28]. There were insufficient data for our intended assessments of global benefit or quality of life.

We defined the short-term end-point as up to 25 weeks from randomization, and took the data point nearest to 12 weeks; the long-term end-point was the last reported measurement between 26 and 52 weeks. Attempts were made to contact authors for missing data wherever necessary.

For crossover studies, the risk of carry-over treatment effects was considered prohibitive, so only the first arm of the study was considered.

Internal validity of trials

The potential for bias in each study was assessed using a modified version of a published scale [29]. We awarded one point each (total 9) when the method of randomization was appropriate, allocation was concealed, patients and caregivers were blinded (one point each), co-interventions were controlled for and reported (one point each), all patients enrolled were accounted for with <20% dropouts in short-term and <30% long-term with no bias between groups, timing of assessment was the same in both groups, and intention to treat analysis was performed. We planned to award a point for assessor blinding but subsequently decided this was superfluous since in all studies, the data extracted were based on patient assessed outcomes. Finally, we subtracted one point if the 'sham' control intervention was inappropriate, as earlier. We applied the quality scores to the results by performing sensitivity analysis with only those studies scoring 50% or more (arbitrary cut-off for high quality) and used appropriate randomization. We also recorded our judgement whether the descriptions of patients and interventions were adequate.

Data synthesis

We reported estimates of the mean difference between groups and the 95% confidence interval (CI) for pain and function both short and long term. We used reported mean difference when available, or calculated the mean difference from reported change scores, or otherwise calculated differences from baseline. We used the variance data for the mean difference where reported, otherwise calculated the SD of change from sample size and t or P value (using the conservative maximum P value) or CI [30]. We did not impute values for missing SDs. For three-arm studies, the analysis prioritized the arms comparing acupuncture with sham acupuncture [19–21].

We then pooled results from only those studies in which the acupuncture was adequate (see above), which used the appropriate WOMAC subscale, and for which within group SD. were available or could be calculated. The primary meta-analysis combined the weighted mean differences of change scores for comparisons of acupuncture and sham acupuncture for short-term and long-term pain reduction, in which studies with smaller variance received greater weighting. We used the conservative random effects [31] analyses in RevMan 4.2 (Cochrane Database), to take account of random variation and differences in study characteristics. We assessed heterogeneity with the I^2 method, which shows the proportion of total variance that is explained by heterogeneity [32]. We explored the reason for heterogeneity between studies when the I^2 value was >50%, considering study setting, patient characteristics or details of treatment and control intervention. We planned two sensitivity analyses where appropriate: omitting studies responsible for heterogeneity, and omitting studies with validity scores <50%. We then compared in narrative the results of the studies that could not be combined. We performed similar comparisons for functional impairment. Finally we pooled studies for comparisons of acupuncture with no additional treatment (including 'waiting list' and 'usual medication' groups), other sham treatment and other intervention when there were sufficient studies.

Results

Studies included in the review

Searches of computerized databases and four previous reviews generated 157 potentially relevant studies (Fig. 1). Searches also located several studies in data collection stage, and at least one study in submission [33], which was published during revision of this review and was included at that stage [21]. One report of an RCT did not provide any treatment details and was excluded [34].

Thirteen studies involving 2362 patients were included in this review, and are summarized in Table 1 [18–21, 35–43]. One study was excluded from the meta-analysis because the acupuncture was not adequate [38], and four others [36, 37, 39, 43] were excluded as they did not present WOMAC data.

One study with four arms was a 'double-dummy' design involving electroacupuncture and diclofenac together with placebo versions of each; we treated these data as two comparisons in one trial [40]. One study used two active acupuncture arms (one with adjunctive medication) and one control arm [42]. Five studies had three arms, and six were conventional two-armed comparative trials. Three studies were conducted in North America, two in the Far East, eight in European countries, but only one study was not published in English [37].

Additional data were obtained directly from authors in four cases [18, 20, 21, 42]. In one case when the mean was not reported [36] we used the median as the inter-quartile range was nearly symmetrical [44].

Six studies, all published since 2002, scored over 50% on the validity scale [18–21, 40, 42]. Randomization was described in sufficient detail to be sure it was both appropriately performed and concealed in five studies [18–21, 42]. Two studies exceeded the limits set for percentage of withdrawals and dropouts [19, 35]. Two studies followed patients for 6 months [19, 21] and one for 12 months [20].

Radiographic confirmation of diagnosis was required for all studies except one [38], though this was not reported in another [39]. The majority of studies included patients with mean WOMAC pain scores of 9/20 or more, mean age 65 yrs, and recruited from the community or hospital out-patients.

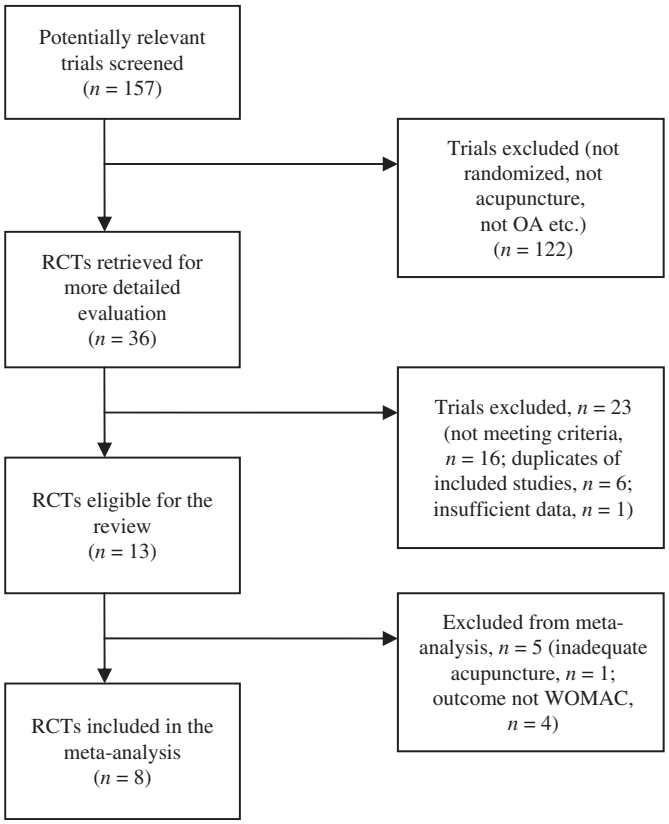

FIG. 1. Selection of trials for inclusion in the review and meta-analysis.

Interventions

The treatment was described sufficiently well to be replicable in all but one study [39]. If patients had both knees involved, three studies [19, 20, 36] specified that both knees were treated, in two [38, 42] only the more painful knee was treated and in one [43] only the right knee. Treatment was standardized to some extent in all studies.

Two studies used true sham (i.e. virtually inactive) acupuncture as a control: Berman and colleagues [19] tapped blunt guide-tubes on the skin near the knee and stuck needles there with adhesive dressing, also genuinely inserting needles in sham points in the abdomen; Vas and colleagues [18] used a blunt, non-penetrating needle. The credibility of these control interventions was rated by patients as equal to that of genuine acupuncture, at least initially, in one study [19]; credibility was not tested in the other [18]. Five other studies used superficial acupuncture at non-points on or near the knee, which is likely to be physiologically active and therefore considered here as an inappropriate control [20, 21, 37, 39, 41].

TABLE 1. Characteristics of RCTs of acupuncture for chronic knee pain [values are means (95% CI) unless otherwise stated]

		Experimental group			Control group		
Reference	Mean age (yrs)	Intervention (number of sessions)	*N*	Baseline pain, function (WOMAC equivalent)	Intervention	*N*	Validity score (max 9)
Berman *et al.* [35]	65	MA, EA (16)	37	9.6, 34.6	Current medication	36	3
Berman *et al.* [19]	65.5	MA, EA (23)	190	8.9, 31.3	True sham acupuncture	191	6
					Education groups	189	
Christensen *et al.* [36]	69.2	MA (6)	14	12, n/a	Waiting list	15	4
Molsberger *et al.* [37]	59.7	MA (10)	71	9.4, n/a	Off-point superficial acupuncture	26	4
Ng *et al.* [38]	85.0	EA (8)	8	9.4, n/a	TENS	8	3
					Education	8	
Petrou *et al.* [39]	63	MA (8)	16	13.5, n/a	Off-point superficial acupuncture	15	3
Sangdee *et al.* [40] (1)	63.0	EA + placebo drug (12)	48	10.3, 38.0	On-point sham TENS + placebo drug	47	6
Sangdee *et al.* [40] (2)		EA + diclofenac (12)	49	10.5, 37.9	Sham TENS + diclofenac	49	
Scharf *et al.* [21]	62.8	MA (12.5)	330	10.6, 37.4	Off-point superficial acupuncture	365	7
					Conservative	342	
Takeda and Wessel [41]	61.6	MA (9)	20	7.8, 24.6	Off-point superficial acupuncture	20	3
Tukmachi *et al.* [42] (1)	61.0	MA, EA (10)	10	10.2, n/a	Current drug	10	6
Tukmachi *et al.* [42] (2)		MA, EA + current drug (10)	10	12.2, n/a			
Vas *et al.* [18]	67.0	EA + diclofenac (12)	48	12.4, 40.5	True sham acupuncture + diclofenac	49	8
Witt *et al.* [20]	64	MA (12)	150	9.9, 34.5	Off-point superficial acupuncture	76	7
					Waiting list	74	
Yurtkuran and Kocagil [43]	58.1	EA (10)	25	5.4, n/a	Sham TENS	25	3
					Acupuncture-like TENS	25	

EA, electroacupuncture; MA, manual acupuncture; n/a, not applicable because not measured.
(1) and (2), different active arms, see text for full explanation.

TABLE 2. Short-term results of RCTs of acupuncture for knee pain compared with various control interventions

Reference	Control intervention	Time point (w)	Difference in pain, scale 0–20 (95% CI), measure if not WOMAC	Difference in function, WOMAC 0–68 (95% CI)
Berman *et al.* [35]	Current medication	12	3.8 (1.5, 6.0)	12.0 (5.6, 18.3)
Berman *et al.* [19]	True sham acupuncture	14	1.0 (0.1, 1.8)	2.8 (0.2, 5.4)
	Education groups	14	2.1 (1.2, 3.0)	6.6 (3.8, 9.4)
Christensen *et al.* [36]	Waiting list	8	6.2[a], VAS	
Molsberger *et al.* [37]	Off-point superficial acupuncture	15	4.0 (0.1, 7.9), VAS	
Ng *et al.* [38]	TENS	4	1.6 (−0.4, 3.6), NRS	
	Education		2.4[a], NRS	
Petrou *et al.* [39]	Off-point superficial acupuncture	3	1.2[a], 4-item scale	
Sangdee *et al.* [40] (1)	On-point sham TENS + placebo	4	2.3 (0.6, 4.1)	6.8 (1.4, 12.3)
Sangdee *et al.* [40] (2)	Sham TENS + diclofenac	4	1.4 (−0.5, 3.2)	4.6 (−0.5, 9.7)
Scharf *et al.* [21]	Off-point superficial acupuncture	12	0.6 (−0.1, 1.3)	1.4 (−0.9, 3.6)
	Conservative	12	2.8 (2.1, 3.5)	8.2 (6.0, 10.3)
Takeda and Wessel [41]	Off-point superficial acupuncture	7	1.2 (−1.1, 3.4)	−1.8 (−10.1, 6.6)
Tukmachi *et al.* [42] (1)	Current drug	5	4.3 (0.2, 8.4)	
Tukmachi *et al.* [42] (2)	Current drug	5	7.9 (2.1, 13.7)	
Vas *et al.* [18]	True sham acupuncture + diclofenac	12	5.0 (2.9, 7.1)	16.6 (9.5, 23.7)
Witt *et al.* [20][a]	Off-point superficial acupuncture		1.4 (0.3, 2.6)	5.0 (1.3, 8.8)
	Waiting list	8	4.1 (1.5, 6.0)	15.2 (11.9, 18.6)
Yurtkuran and Kocagil [43]	Sham TENS	2	4.6[a], PPI	
	Acupuncture-like TENS	2	1.4[a], PPI	

NRS, numerical rating scale; PPI, Present Pain Index; VAS, visual analogue scale.
[a]Confidence interval cannot be calculated from published data.

TABLE 3. Long-term results of RCTs of acupuncture for knee pain compared with various control interventions

Reference	Control intervention	Time point (w)	Difference in pain, WOMAC scale 0–20 (95% CI)	Difference in function, WOMAC 0–68 (95% CI)
Berman *et al.* [19]	True sham acupuncture	26	0.9 (0.0, 1.7)	2.5 (−0.03, 5.4)
	Education groups	26	2.1 (1.2, 3.0)	5.3 (2.2, 8.3)
Scharf *et al.* [21]	Off-point superficial acupuncture	26	0.4 (−0.3, 1.3)	1.4 (−1.0, 3.7)
	Usual care	26	2.2 (1.5, 2.9)	6.8 (4.5, 9.1)
Witt *et al.* [20]	Off-point superficial acupuncture	52	0.3 (−1.1, 1.7)	3.1 (−1.2, 7.3)

The number of sessions given to the intervention and control groups was the same with the exception of one study [19] in which education was given in six visits compared with 23 visits for acupuncture and sham acupuncture.

Outcomes

Eight studies used the WOMAC subscale for pain (Table 1), three used pain scales of 0 to 10, and two used either a five-point scale [39] or a six-point scale [43] (both of which we treated as continuous scales for conversion). One study assessed pain during four activities; we took the mean [39]. Seven studies reported the WOMAC function subscale [18–21, 35, 40, 41].

Between-group differences are presented in Table 2 (short-term) and Table 3 (long-term).

Synthesis

Twelve comparisons involved more than one study, and the results of these meta-analyses are summarized in Table 4.

Sham acupuncture control. For pain reduction in the short-term, acupuncture was significantly superior (Fig. 2) but with high heterogeneity due to one strongly positive study [18]. In this study, patients with high baseline pain and poor function were treated with electrical stimulation at all needles and also received diclofenac; the control group were given a blunt, non-penetrating needle. After omitting this outlying study, acupuncture was still significantly superior to sham acupuncture (result shown in Fig. 2). The positive result was stable on excluding the one study with lower quality [41], and is consistent with the results of the two studies that could not be combined [37, 39].

For improvement of function in the short term, acupuncture was also significantly superior (Fig. 3), again with high heterogeneity, which was solely due to one outlying study [18], and again unaffected by omitting the one lower quality study.

Acupuncture remained significantly superior to sham acupuncture at long-term outcome for both pain and function (Table 4) in three studies which are all higher quality.

Other sham control. There were insufficient studies to combine. Acupuncture showed either significant or a strong trend towards superiority over sham transcutaneous electrical nerve stimulation (TENS) for pain in three comparisons in two studies [40, 43], and for function in one study [40].

No additional treatment control. For pain reduction, acupuncture was significantly superior with no significant heterogeneity (Table 4). For improvement of function, acupuncture was significantly superior but with significant heterogeneity; this was solely due to the study [21] in which all groups received intensive physiotherapy and which showed a reduced, but still significant, differential in favour of acupuncture (Table 2). This pattern was not meaningfully changed in selecting just higher quality studies. One study found this difference persisted for 6 months [21].

Other treatment control. Acupuncture was superior to education for both pain and function in one study [19], and the difference persisted at long-term follow-up. Acupuncture was not shown to be significantly better than acupuncture-like TENS [43].

TABLE 4. Results of meta-analyses (and sensitivity analyses) of acupuncture for chronic knee pain: numbers combined, heterogeneity and weighted mean difference (random effects)

	N studies (*N* excluded)	*N* participants	Heterogeneity I^2 (%)[a]	Weighted mean difference (95% CI)
Pain, short-term				
vs sham	5 (2)	1334	74.5	1.54 (0.49, 2.60)
Excluding outlying study	4	1246	0	0.87 (0.40, 1.34)
High-quality studies	4	1294	80.9	1.06 (0.59, 1.53)
vs true sham	2	403	91.7	2.87 (−1.12, 6.85)
vs other sham	1 (1)			insufficient
vs no additional treatment	4 (1)	927	37.5	3.42 (2.58, 4.25)
High-quality studies	3	854	56.3	3.42 (2.36, 4.48)
vs other treatment	1 (1)			insufficient
Pain, long term				
vs sham	3	1178	0	0.54 (0.05, 1.04)
Function, short term				
vs sham	5	1333	78.4	4.32 (0.60, 8.05)
Excluding outlying study	4	1245	20.2	2.41 (0.60, 4.21)
High-quality studies	4	1293	82.6	3.10 (1.59, 4.61)
vs true sham	2	403	92.1	9.27 (−4.23, 22.77)
vs other sham	1			insufficient
vs no additional treatment	3	907	83.8	11.65 (6.48, 16.81)
High-quality studies	2	834	91.7	11.58 (4.64, 18.51)
vs other treatment	1			insufficient
Function, long term				
vs sham	3	1178	0	2.01 (0.36, 3.66)

[a]Heterogeneity scores >50% indicate meaningful heterogeneity.

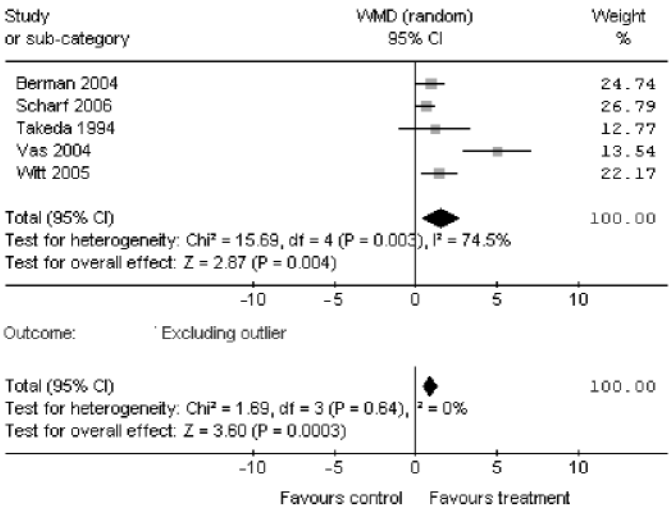

FIG. 2. Meta-analysis of short-term WOMAC pain scores, acupuncture compared with sham acupuncture: full analysis, and sensitivity analysis excluding outlying study [18].

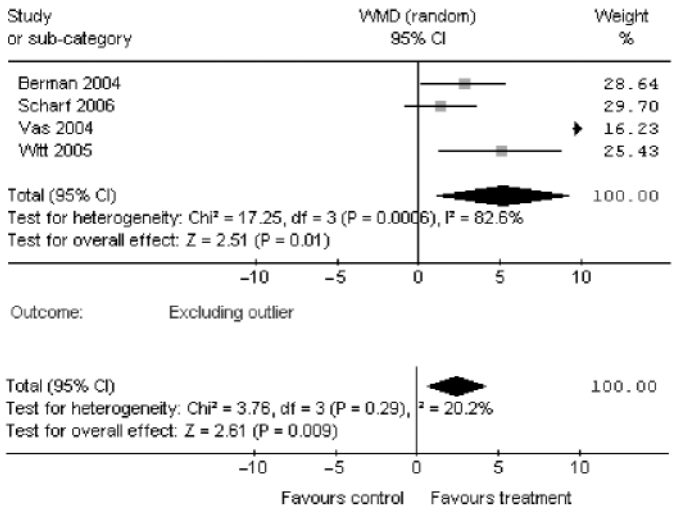

FIG. 3. Meta-analysis of short-term WOMAC function scores, acupuncture compared with sham acupuncture: full analysis, and sensitivity analysis excluding outlying study [18].

Discussion

This review has found evidence that acupuncture that meets specified criteria for adequacy is superior to sham (or placebo) acupuncture for treating chronic knee pain, both in the short term and the long term.

The results are reliable in that they rely largely on high quality studies of reasonable size from different research groups [18–21]. The results are also robust to sensitivity analysis for the effects of study validity.

Acupuncture was also superior to no additional (i.e. usual) care for both pain and function, although this result is weakened by heterogeneity.

Heterogeneity of study results is often considered a potential limitation in systematic reviews. In this review, the studies that were homogeneous had a positive outcome when combined; and the study responsible for virtually all the statistical heterogeneity [18] is outstanding for its strongly positive results. Thus we decided to present two summary estimates so that the effects of removing the one highly positive study can be seen. Possible reasons for this study's strongly positive results are: the sample had more severe symptoms; treatment was stronger (this was the only study to use electrical stimulation to four pairs of needles); the sham control was a blunt needle; and both groups were also given diclofenac. The effect of this heterogeneity is more theoretical than practical: whether the single study or the remaining studies more accurately represent the true estimate of the effect, the combined evidence shows a positive effect.

The pre-planned analysis using 'true sham' control (excluding those studies in which the control group had needles inserted near the knee, probably a weakly active treatment) combined two studies that were individually positive, but the result showed only a trend because of heterogeneity (Table 4).

This review incorporated the important concept that an 'adequate' stimulation with acupuncture needles is needed to produce an adequate response, based on a neurological model of acupuncture [22]. This concept seems supported by the fact that the single study that used 'inadequate' acupuncture, with only two needles, found a non-significant effect [38].

The results are inevitably limited by the small number of studies, which is a feature of the lack of research capacity and funding in acupuncture that has been noted [45].

Implications

This review provides some evidence that acupuncture is superior to placebo for chronic knee pain. Acupuncture is known to be safe in the hands of trained practitioners [46] and can therefore be considered an evidence-based option for managing patients. The size of the effect on pain was not dramatic: recalculating the data as standardized mean difference, the effect size compared to sham acupuncture is 0.4 which is considered 'moderate' [47] but the 95% CI around this estimate are wide (0.1, 0.6), suggesting the need for further large studies in the future. This effect is similar to that of non-steroidal anti-inflammatory drugs (NSAIDs) (0.32, CI 0.24–0.39) in a recent meta-analysis of 23 studies [8], though of course medication needs to be taken every day. It is also similar to the outcome at 1 week for topical NSAIDs but at 4 weeks there was no difference from placebo for topical NSAIDs [48].

Although the results of this meta-analysis are not strong enough to make firm recommendations for long-term treatment, the amount of high quality, long-term evidence for acupuncture is impressive when compared with the evidence for many other interventions for chronic knee pain. For example, recent reviews could find no long-term data to support the use of oral or topical NSAIDs [8, 48].

It seems increasingly unlikely that acupuncture can be dismissed as 'just a placebo'. Similar specific effects of acupuncture compared with sham acupuncture have been found in rigorous reviews of nausea [49] and back pain [50]. Adverse sentiment towards acupuncture may be associated with the traditional Chinese interpretations, which still prevail among some practitioners; acupuncture is more acceptable as part of rational-based health care when considered as a form of sensory stimulation according to currently accepted understanding of neurophysiology, rather than using the historical model.

Further large-scale studies are needed to provide more definitive information, particularly on the long-term effects of acupuncture for knee arthritis, as well as pragmatic studies to refine the indications and optimize the application. In addition, it is clear that studies comparing acupuncture with other relatively safe, non-pharmacological interventions recommended by international guidelines for OA and knee pain, such as exercise, are lacking and future research should address this.

In conclusion, acupuncture is superior to placebo treatments for the management of pain and dysfunction in patients with chronic knee pain. The evidence appears to be robust enough to encourage wider use of acupuncture for chronic knee pain, but further large, high-quality trials are needed in order to reach more definitive conclusions in the future.

Rheumatology key messages

- Acupuncture is widely used for treatment of painful joints.
- This meta-analysis shows that adequate acupuncture is superior to sham and to usual care in the short term for chronic knee pain.
- More clinical trials are needed to fully address the long-term effects.

Acknowledgements

The authors are grateful to John Campbell for his valued comments on an earlier version of the text. A.W. and N.E.F. are supported by the DH-National Co-ordinating Centre for Research Capacity Development (NCC RCD). Funding sources had no role in design, conduct or reporting of the review.

N.E.F. is a member of the APEX trial team, investigating the role of acupuncture and exercise for knee pain. A.W. and M.C. are employees of the British Medical Acupuncture Society. A.W. is an editor in chief of the journal Acupuncture in Medicine. A.W. also runs a small private acupuncture practice. P.B. receives income from teaching acupuncture.

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