Needle acupuncture for osteoarthritis of the knee

A systematic review and updated meta-analysis

Le Cao, MD, PhD, *Xian-Long Zhang,* MD, PhD, *You-Shui Gao,* MD, PhD, *Yao Jiang,* MD, PhD.

ABSTRACT

الأهداف : تقييم فعالية الوخز بالإبر الصينية من أجل علاج التهاب المفاصل والعظام في الركبة .

الطريقة : لقد قمنا بالبحث عن التجارب المراقبة العشوائية في قاعدة بيانات كلاً من : PUBMED، EMBASE، Chochrane والتي أجريت خلال الفترة من يوليو إلى أكتوبر 2011م . وكانت هذه التجارب تقوم بالمقارنة بين المجموعات التي خضعت للعلاج بالإبر الصينية، والوخز الزائف بالإبر الصينية، والعلاج العادي، ومجموعة الشاهد التي كانت في لائحة الانتظار . وشملت الدراسة 14 تجربة تتضمن 3835 مريض من أصل 490 مقال شمله التحليل البعدي . لقد قام باحثان باستخلاص نتائج الدراسة على أساس درجة الألم على المدى القصير والمدى البعيد، وعلى أساس المقاييس الوظيفية .

النتائج : لقد قمنا بحساب متوسط الفروق المعيارية ومدى الأمان الإحصائي وذلك بواسطة استخدام متوسط الفروق في تحسن الألم بين المعطيات الأساسية والفروق في الانحراف المعياري لدى المرضى في مجموعة العلاج بالإبر الصينية، ومجموعة الوخز الزائف بالإبر، ومجموعة الشاهد بالاعتماد على نقاط الوقت المختلفة . وأظهر العلاج بالإبر الصينية تحسناً في تخفيف الألم (p=0.002)، واستعادة الوظائف (p=0.01) على المدى القصير، بالإضافة إلى تخفيف الألم (p=0.06)، واستعادة الوظائف (p=0.06) على المدى البعيد وذلك عند المقارنة مع مجموعتي الوخز الزائف بالإبر ومجموعة الشاهد . كما كان للوخز بالإبر الصينية تأثيراً واضحاً من الناحية الإحصائية على تخفيف الألم واستعادة الوظائف وذلك عند المقارنة مع مجموعة الرعاية العادية ومجموعة الشاهد في لائحة الانتظار .

خاتمة : أثبتت الدراسة بأن العلاج بالإبر الصينية له فعالية واضحة من الناحية الإحصائية في تخفيف ألم الركبة التي تعاني من التهاب المفاصل، بالإضافة إلى تحسين الوظائف وذلك عند المقارنة مع مجموعة الوخز الزائف بالإبر الصينية، ومجموعة العلاج العادي، ومجموعة الشاهد في لائحة الانتظار .

Objective: To evaluate the efficacy of treatment with acupuncture for knee osteoarthritis.

Methods: We searched PUBMED, EMBASE, and the Cochrane Central Register of Controlled Trials databases from July to October 2011 for randomized controlled trials that compared needle acupuncture with sham acupuncture, standard care, or waiting list control groups in patients with knee osteoarthritis. Of the 490 potentially relevant articles, 14 RCTs involving 3,835 patients were included in the meta-analysis. Two authors independently extracted outcome data on short-term and long-term pain and functional measures.

Results: Standardized mean differences and 95% confidence intervals were calculated using the mean differences in improvements from baseline and the associated standard deviations in patients assigned to acupuncture and those assigned to control groups according to measurement time points. Compared with sham acupuncture control treatment, acupuncture was significantly better at relieving pain (p=0.002) and restoring function (p=0.01) in the short-term period, and relieving pain (p=0.06) and restoring function (p=0.06) in the long-term. Compared with the standard care and waiting list control treatments, acupuncture was significantly better at relieving pain and restoring function.

Conclusion: Acupuncture provided significantly better relief from knee osteoarthritis pain and a larger improvement in function than sham acupuncture, standard care treatment, or waiting for further treatment.

07Needle20115509.indd   526   5/19/12   3:11:16 PM

Knee osteoarthritis (KOA) is the most common form of arthritis and the leading cause of disability among the elderly.[1] The most widely used pharmacologic agents for treating KOA are nonsteroidal anti-inflammatory drugs (NSAIDs) and acetaminophen.[2] However, according to recent systematic reviews,[3] NSAIDs and acetaminophen are only slightly better than placebo at relieving knee pain in the short-term. Additionally, pharmacologic agents are associated with serious side effects including upper gastrointestinal bleeding or perforation and cardiovascular disease.[4] Non-pharmacological treatments for KOA include exercise, weight loss, and acupuncture. These alternatives are increasingly attractive and are included in current recommendations for treatment.[5] According to acupuncture theory, the term "de qi" means when the patient experiences a sensation of numbness or tingling, which indicates that the acupuncture is exerting its analgesic effects at the needle insertion point. Acupuncture is considered a safe therapy that has a low risk for serious side effects,[6] though its effectiveness for treating KOA is still controversial.[7]

Recent systematic reviews of acupuncture for KOA showed differing results, and their conclusions were limited by the small number of studies and heterogeneity in the results.[7-10] Recently, additional randomized controlled trials (RCTs) were published.[11-13] Therefore, it is timely to reconsider the efficacy and safety of acupuncture. Thus, we conducted a systematic review and meta-analysis on the effects of acupuncture for treating KOA compared with sham acupuncture, standard care (for example, NSAID, other analgesics, topical NSAIDs or analgesics, exercises and so forth), and waiting list.

Methods. *Search strategy and study selection.* We searched PUBMED, EMBASE, and the Cochrane Central Register of Controlled Trials (CENTRAL) databases from July 2011 to October 2011 to identify randomized controlled trials (RCTs). We searched the following terms: i. acupuncture OR acupuncture therapy OR electroacupuncture OR moxibustion OR Chinese traditional medicine OR oriental traditional medicine; ii. osteoarthritis OR arthritis OR degenerative arthritis OR osteoarthrosis OR gonarthrosis OR joint diseases OR joint pain. We combined the results and limited the search to human subjects and RCTs. References of selected articles and previous systematic reviews of acupuncture for osteoarthritis of the knee[7-10] were also scanned for inclusion in this review.

Two independent authors assessed articles for inclusion and resolved disagreements by discussion.

The inclusion criteria were RCTs for patients with KOA treated with needle acupuncture with or without electrical stimulation compared with other treatments. The exclusion criteria were RCTs that compared only 2 different forms of acupuncture and those that used trigger-point therapy or laser acupuncture. No language restrictions were applied.

Data extraction and validity assessment. Two independent authors extracted data and resolved disagreements by discussion. We extracted information including study characteristics, participants, interventions, measurement time points and outcomes (including pain and function). When a trial reported pain or function score using several measures, we selected the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC)[14] subscale for pain (range, 0-20) and function (range, 0-68) because the WOMAC index is the most extensively used and thoroughly validated instrument for assessing patients with KOA.[14] We wrote to corresponding authors via e-mail to request the WOMAC pain and function data if the article did not include the original data.

We assessed internal validity of the included RCTs by using an 11-item scale developed by the Cochrane Collaboration Back Review Group.[15] The 11 elements of the scale were as follows: A. Was the method of randomization adequate?; B. Was the treatment allocation concealed?; C. Were the groups similar at baseline regarding the most important prognostic indicators?; D. Was the patient blinded to the intervention?; E. Was the care provider blinded to the intervention?; F. Was the outcome assessor blinded to the intervention?; G. Were co-interventions avoided or similar?; H. Was the compliance acceptable in all groups?; I. Was the drop-out rate described and acceptable?; J. Was the timing of the outcome assessment in all groups similar?; and K. Did the analysis include an intention-to-treat analysis? We assessed the scales with each item scored as '1' for 'Yes', '0' for 'No', '0.5' for 'partially yes' (for D and F only) and '?' for 'not reported or unclear', and calculated the total score. A score greater than 6 indicates that the RCTs have high internal validity.[7]

Data synthesis and statistical analysis. We conducted comparisons with respect to the control groups, which were sham acupuncture, standard care, and waiting list (waiting for acupuncture). We defined the sham acupuncture control as groups that received non-penetrating sham acupuncture ('placebo' needle) therapy. The standard care control group received some additional standard therapy (for example NSAID, other analgesics, topical NSAIDs or analgesics, exercises, and so forth), and the waiting list control group did
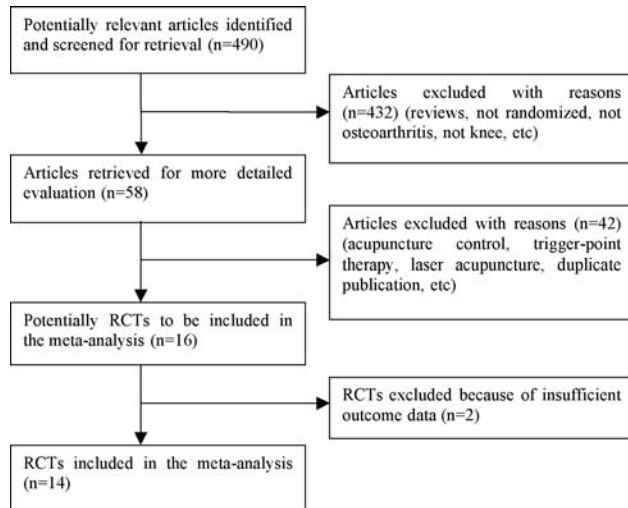
Figure 1 - Selection flow diagram.

not receive any care while they waited for acupuncture. The needle acupuncture group did not receive drug or other therapy before acupuncture. For each control group, we conducted a subgroup analysis according to measurement points: short-term (closest to 8 weeks but no longer than 3 months after randomization) and long-term (closest to 6 months but longer than 3 months after randomization).

All of the meta-analyses were performed with Review Manager version 5.1 (The Cochrane Collaboration). We used the random-effects model (DerSimonian and Laird model)[10] to calculate standardized mean differences and 95% confidence intervals (CI) for all of the RCTs between the 2 compared groups using the mean differences in improvements from baseline and related standard deviations (SDs) of improvements. We used reported mean differences and SDs when available, and in cases where this was not available, we calculated these data by using Comprehensive Meta-Analysis Version 2 software. Heterogeneity was assessed by Cochrane's X^2 test (using a 10% significance level)s and the I^2 statistic (using a 50% significance level).

Results. *Characteristics of the included RCTs.* The results of the search strategy for articles are shown in **Figure 1**. Of the 490 potentially relevant articles, 58 RCTs met the inclusion criteria. Fourteen of the eligible RCTs, which assessed 3,835 patients,[11-13,16-26] were included in the meta-analysis (**Table 1**). According to the Cochrane Back Review Group scale, 11 RCTs had high internal validity and 3 RCTs had low internal validity (**Table 2**). No serious adverse events were reported to be associated with acupuncture in the RCTs.

Table 1 - Characteristics of randomized controlled trails included in the meta-analysis.

Study, year	Location	Mean Age, y	Women, %	Style	Acupuncture Group			Control Group		Measurement Time Points, wk
					Sessions, n	Duration, wk	Patients, n	Type	Patients, n	
Berman 1999[16]	United States	65.0	60.3	MA, EA	16	8	36	Waiting list	37	4, 8, 12
Berman 2004[17]	United States	65.5	64.0	MA, EA	23	26	190	Sham acup	191	4, 8, 14, 26
								Usual care	189	
Foster 2007[18]	United Kingdom	63.5	61.4	MA	6	3	117	Sham acup	119	2, 6, 26, 52
								Usual care	116	
Jubb 2008[11]	United Kingdom	65.1	70.5	MA, EA	10	5	34	Sham acup	34	5, 9
Lansdown 2009[12]	United Kingdom	63.5	60.0	MA	10	4	15	Usual care	15	4, 13, 52
Sangdee 2002[19]	Thailand	63.0	77.7	EA	12	4	49	Sham acup*	49	4
							48	Sham acup†	47	
Scharf 2006[20]	Germany	63.0	68.8	MA	10	6	330	Sham acup	367	13, 26
								Usual care	342	
Suarez-Almazor 2010[13]	United States	64.5	64.1	EA	12	6	153	Sham acup	302	4, 6, 13
								Waiting list	72	
Takeda 1994[21]	Canada	62.0	50.0	MA	9	3	20	Sham acup	20	3, 7
Tukmachi 2004[22]	United Kingdom	62.0	82.8	MA	10	5	10	Waiting list	10	5
				MA	10	5	9			
Vas 2004[23]	Spain	67.0	83.5	MA, EA	12	12	48	Sham acup	49	13
Williamson 2007[24]	United Kingdom	71.0	53.6	MA	6	6	60	Usual care‡	60	7, 12
								Usual care§	61	
Witt 2005[25]	Germany	64.0	66.3	MA	12	8	149	Sham acup	75	8, 26, 52
								Waiting list	70	
Witt 2006[26]	Germany	61.0	60.5	MA	11	13	175	Waiting list	167	13

MA - manual acupuncture, EA - electric stimulation acupuncture, *sham acupuncture with co-intervention of diclofenac, †sham acupuncture with co-intervention of placebo diclofenac, ‡physiotherapy, §advice and exercise, wk - weeks, y - years

Table 2 - Cochrane Back Review Group Quality Scores.

Study, year	A	B	C	D	E	F	G	H	I	J	K	Total
Berman 1999[16]	1	1	1	0	0	0	1	1	1	1	1	**8**
Berman 2004[17]	1	1	1	0.5/0	0	0.5/0	1	1/0	1/0	1	1	**9/6***
Foster 2007[18]	1	1	1	1/0	0	1/0	1/0	1	1	1	0/1	**9/7***
Jubb 2008[11]	1	1	1	1	0	0	1	1	1	1	0	**8**
Lansdown 2009[12]	1	1	1	0	0	0	1	1	1	1	1	**8**
Sangdee 2002[19]	?	0	1	0.5	0	0.5	1	1	1	1	0	**6**
Scharf 2006[20]	1	1	1	1/0	0	1/0	0	1	1	1	1	**9/7***
Suarez-Almazor 2010[13]	1	1	1	1/0	0	0	1/0	?	1	1	1	**8/6†**
Takeda 1994[21]	1	1	0	0.5	0	0.5	?	?	1	1	0	**5**
Tukmachi 2004[22]	1	1	?	0	0	0	?	?	1	1	0	**4**
Vas 2004[23]	1	1	1	0.5	0	0.5	1	1	0	1	1	**8**
Williamson 2007[24]	1	1	1	0	0	0	?	?	0	1	1	**5**
Witt 2005[25]	1	1	1	1/0	0	1/0	1	1	1	1	1	**10/8†**
Witt 2006[26]	1	1	1	0	0	0	?	?	1	1	1	**6**

*score for sham control group / score for usual care control group, †score for sham control group / score for waiting list control group
The 11 elements of the scale were as follows: A. Was the method of randomization adequate?; B. Was the treatment allocation concealed?; C. Were the groups similar at baseline regarding the most important prognostic indicators? ; D. Was the patient blinded to the intervention?; E. Was the care provider blinded to the intervention?; F. Was the outcome assessor blinded to the intervention?; G. Were co-interventions avoided or similar?; H. Was the compliance acceptable in all groups?; I. Was the drop-out rate described and acceptable?; J. Was the timing of the outcome assessment in all groups similar?; and K. Did the analysis include an intention-to-treat analysis? We assessed the scales with each item scored as '1' for 'Yes', '0' for 'No', '0.5' for 'partially yes' (for D and F only) and '?' for 'not reported or unclear', and calculated the total score.[15]

Acupuncture versus sham acupuncture. In comparison with sham acupuncture, at the short-term follow-up, acupuncture was clinically and statistically significantly better at relieving KOA pain (10 trials, 2289 patients; p=0.002; standardized mean difference, -0.25 [95% CI, -0.42 to -0.09]; I^2=67%) and restoring function (10 trials, 2283 patients; p=0.01; standardized mean difference, -0.22 [95% CI, -0.40 to -0.05]; I^2=71%) (**Figure 2**). Furthermore, acupuncture was clinically significantly better at relieving pain (4 trials, 1399 patients; p=0.06; standardized mean difference, -0.10 [95% CI, -0.21 to -0.01]; I^2= 0%) and restoring function (4 trials, 1397 patients; p=0.06; standardized mean difference, -0.11 [95% CI, -0.22 to -0.00]; I^2= 8%) compared with sham control over the long-term (**Figure 3**).

Acupuncture versus usual care. In comparison with control patients treated with the standard care methodologies, patients who received acupuncture had clinically and statistically significantly better relief of KOA pain (6 trials, 1406 patients; p<0.001; standardized mean difference, -0.43 [95% CI, -0.63 to -0.23]; I^2=63%) and restoration of function (6 trials, 1405 patients; p=<0.001; standardized mean difference, -0.36 [95% CI, -0.54 to -0.18]; I^2=58%) at the short-term follow-up. Pain relief (4 trials, 1117 patients; p=0.01; standardized mean difference, -0.35 [95% CI, -0.63 to -0.07]; I^2=75%) and preservation of function (4 trials, 1113 patients; p=0.02; standardized mean difference,

-0.29 [95% CI, -0.53 to -0.05]; I^2=65%) were also clinically significantly better in the acupuncture group at long-term follow-up (**Figure 4**).

Acupuncture versus waiting list. In comparison with the waiting list controls at the short-term follow-up, subjects who received acupuncture had clinically and statistically significantly better relief of KOA pain (5 trials, 840 patients; p<0.001; standardized mean difference, -0.89 [95% CI, -1.10 to -0.67]; I^2=46%) and preservation of function (5 trials, 812 patients; p<0.001; standardized mean difference, -0.83 [95% CI, -1.08 to -0.58]; I^2=61%) (**Figure 5**).

Discussion. A previous systematic review strongly indicated that acupuncture reduced pain compared with sham acupuncture and concluded that acupuncture may play a role in the treatment of KOA.[8] Since the publication of this and other systematic reviews,[7,9,10] several more RCTs have recently been published.[11-13] As a result, we conducted an updated systematic review and meta-analysis. Acupuncture was significantly better at relieving pain and restoring function compared with sham acupuncture, standard care treatment, and waiting list.

We opted to assess internal validity using an 11-item scale developed by the Cochrane Collaboration Back Review Group[15] in which 3 points are scored for patient blinding, care provider blinding, and assessor blinding, separately. There are many other systems to assess methodological quality, some of which are more
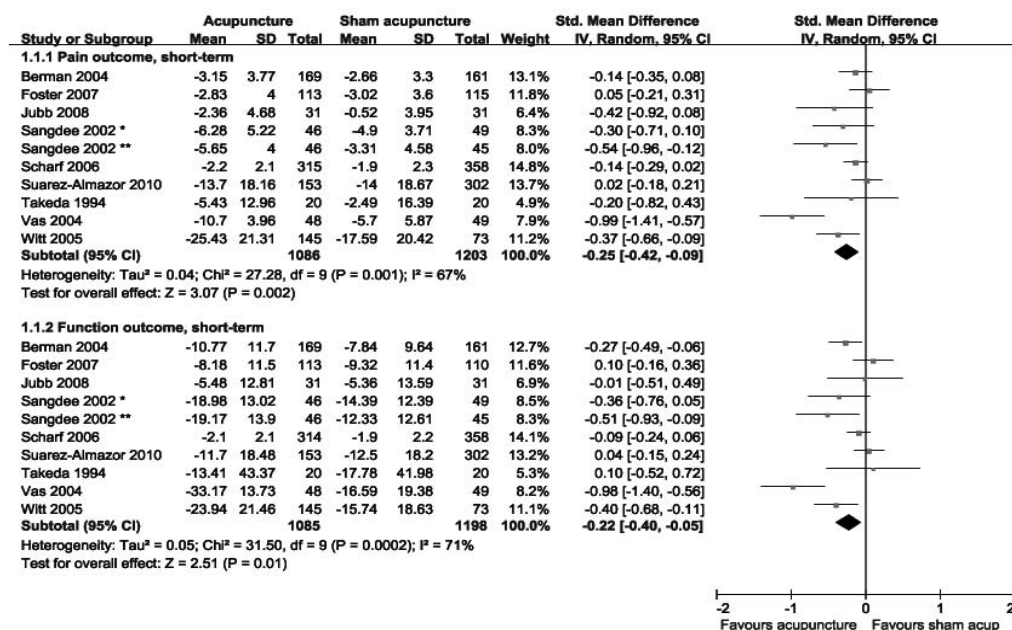
Figure 2 - Comparison: 1 Acupuncture versus sham acupuncture. Outcome: 1.1 Pain and function, short-term. *sham acupuncture with co-intervention of diclopenac, **sham acupuncture with co-intervention of placebo diclopenac
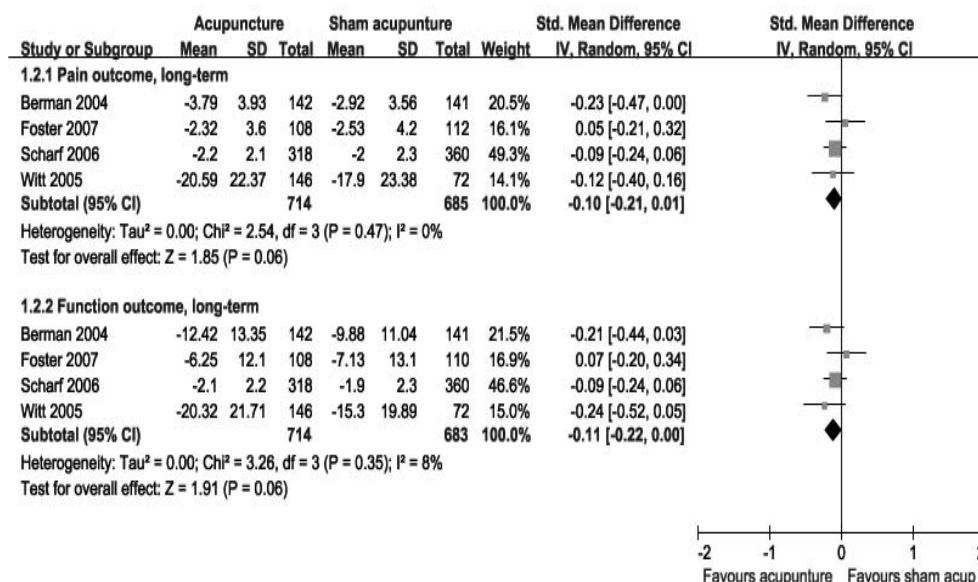
Figure 3 - Comparison: 1 Acupuncture versus sham acupuncture. Outcome: 1.2 Pain and function, long-term.

elaborate. However, the 11-item Cochrane scale is an accepted, frequently used, and easy to apply score.

Acupuncture was compared with different types of control interventions. Depending on the type of the control intervention, different conclusions can be drawn. The placebo effect of acupuncture as a treatment for knee pain can be impressive. Several sham acupuncture methods have been tried. These methods consist of puncturing the skin outside acupuncture points, puncturing the skin superficially without stimulation, and eliciting a sensation on the skin without puncturing the skin. To reliably account for the placebo effect, it is important that the sham procedure is indistinguishable from the real treatment. Therefore, the success of the blinding procedures should be assessed.

Our systematic review has some limitations. Although great efforts were made to scan all RCTs on the subject, we cannot be absolutely sure that our searches included

Study or Subgroup	Acupuncture Mean	SD	Total	Usual care Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
2.1.1 Pain outcome, short-term								
Berman 2004	-3.15	3.75	169	-1.25	3.37	125	20.7%	-0.53 [-0.76, -0.29]
Foster 2007	-2.83	4	113	-2.1	3.5	105	19.2%	-0.19 [-0.46, 0.07]
Lansdown 2009	-3.73	2.87	15	-0.83	4.17	15	5.7%	-0.79 [-1.54, -0.04]
Scharf 2006	-2.2	2.1	315	-0.8	2.1	308	24.5%	-0.67 [-0.83, -0.50]
Williamson 2007 *	-0.6	2.78	60	0.18	2.3	61	15.0%	-0.30 [-0.66, 0.05]
Williamson 2007 **	-0.6	2.78	60	0	3.22	60	15.0%	-0.20 [-0.56, 0.16]
Subtotal (95% CI)			732			674	100.0%	-0.43 [-0.63, -0.23]

Heterogeneity: Tau² = 0.04; Chi² = 13.62, df = 5 (P = 0.02); I² = 63%
Test for overall effect: Z = 4.24 (P < 0.0001)

	Acupuncture Mean	SD	Total	Usual care Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
2.1.2 Function outcome, short-term								
Berman 2004	-10.8	11.7	169	-5.3	10.6	125	21.0%	-0.49 [-0.72, -0.25]
Foster 2007	-8.18	11.5	113	-6.21	11.4	105	19.1%	-0.17 [-0.44, 0.09]
Lansdown 2009	-7.13	12.4	15	-4.41	13.1	15	5.4%	-0.21 [-0.93, 0.51]
Scharf 2006	-2.1	2.1	314	-0.9	1.9	308	25.6%	-0.60 [-0.76, -0.44]
Williamson 2007 *	-1.6	7.75	60	0.67	8.16	61	14.4%	-0.28 [-0.64, 0.07]
Williamson 2007 **	-1.6	7.75	60	-0.5	9.26	60	14.4%	-0.13 [-0.49, 0.23]
Subtotal (95% CI)			731			674	100.0%	-0.36 [-0.54, -0.18]

Heterogeneity: Tau² = 0.03; Chi² = 11.81, df = 5 (P = 0.04); I² = 58%
Test for overall effect: Z = 3.83 (P = 0.0001)

	Acupuncture Mean	SD	Total	Usual care Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
2.1.3 Pain outcome, long-term								
Berman 2004	-3.79	3.93	142	-1.69	3.48	108	28.4%	-0.56 [-0.81, -0.30]
Foster 2007	-2.32	3.6	108	-2.28	3.8	105	27.7%	-0.01 [-0.28, 0.26]
Lansdown 2009	-2.63	2.599	15	-2.1	3.786	15	10.7%	-0.16 [-0.88, 0.56]
Scharf 2006	-2.2	2.1	318	-1.1	2.2	306	33.2%	-0.51 [-0.67, -0.35]
Subtotal (95% CI)			583			534	100.0%	-0.35 [-0.63, -0.07]

Heterogeneity: Tau² = 0.05; Chi² = 11.82, df = 3 (P = 0.008); I² = 75%
Test for overall effect: Z = 2.45 (P = 0.01)

	Acupuncture Mean	SD	Total	Usual care Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
2.1.4 Function outcome, long-term								
Berman 2004	-12.42	13.29	142	-7.17	11.13	108	28.6%	-0.42 [-0.67, -0.17]
Foster 2007	-6.25	12.1	108	-4.6	11.4	101	27.2%	-0.14 [-0.41, 0.13]
Lansdown 2009	-3.13	13.35	15	-8.67	13.34	15	8.6%	0.40 [-0.32, 1.13]
Scharf 2006	-2.1	2.2	318	-1.1	2.1	306	35.6%	-0.46 [-0.62, -0.31]
Subtotal (95% CI)			583			530	100.0%	-0.29 [-0.53, -0.05]

Heterogeneity: Tau² = 0.03; Chi² = 8.66, df = 3 (P = 0.03); I² = 65%
Test for overall effect: Z = 2.38 (P = 0.02)

-2 -1 0 1
Favours acupuncture   Favours usual care

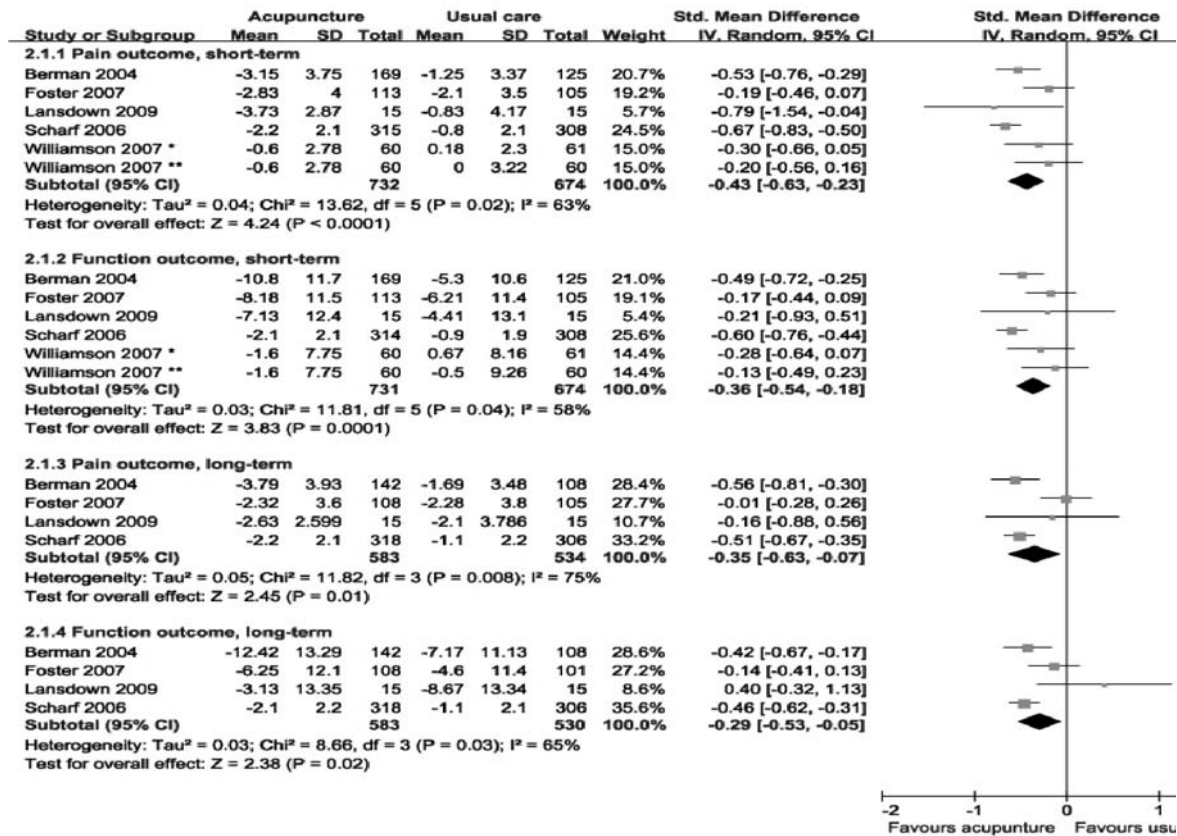**Figure 4 -** Comparison: 2 Acupuncture versus usual care. Outcome: 2.1 Pain and function, short-term and long-term.

Study or Subgroup	Acupuncture Mean	SD	Total	Waiting list Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
3.1.1 Pain outcome, short-term								
Berman 1999	-4.24	7.08	36	-0.32	2.73	37	14.7%	-0.73 [-1.20, -0.25]
Suarez-Almazor 2010	-13.7	18.16	153	-1.7	16.06	72	26.2%	-0.68 [-0.97, -0.40]
Tukmachi 2004	-7.8	5.16	10	0.1	0.14	10	3.5%	-2.07 [-3.21, -0.94]
Witt 2005	-25.43	21.31	145	-5.25	15.15	67	24.7%	-1.03 [-1.33, -0.72]
Witt 2006	-19.2	19.9	160	-3.7	14.4	150	30.9%	-0.89 [-1.12, -0.65]
Subtotal (95% CI)			504			336	100.0%	-0.89 [-1.10, -0.67]

Heterogeneity: Tau² = 0.03; Chi² = 7.35, df = 4 (P = 0.12); I² = 46%
Test for overall effect: Z = 7.91 (P < 0.00001)

	Acupuncture Mean	SD	Total	Waiting list Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
3.1.2 Function outcome, short-term								
Berman 1999	-14.25	23.81	36	-0.05	0.78	37	16.5%	-0.84 [-1.32, -0.36]
Suarez-Almazor 2010	-11.7	18.48	153	-1.6	17.3	72	27.2%	-0.56 [-0.84, -0.27]
Witt 2005	-23.94	21.46	145	-1.38	14.64	67	25.6%	-1.15 [-1.46, -0.84]
Witt 2006	-14.4	19.6	156	-0.9	13.5	146	30.8%	-0.80 [-1.03, -0.56]
Subtotal (95% CI)			490			322	100.0%	-0.83 [-1.08, -0.58]

Heterogeneity: Tau² = 0.04; Chi² = 7.67, df = 3 (P = 0.05); I² = 61%
Test for overall effect: Z = 6.51 (P < 0.00001)

-2 -1 0 1 2
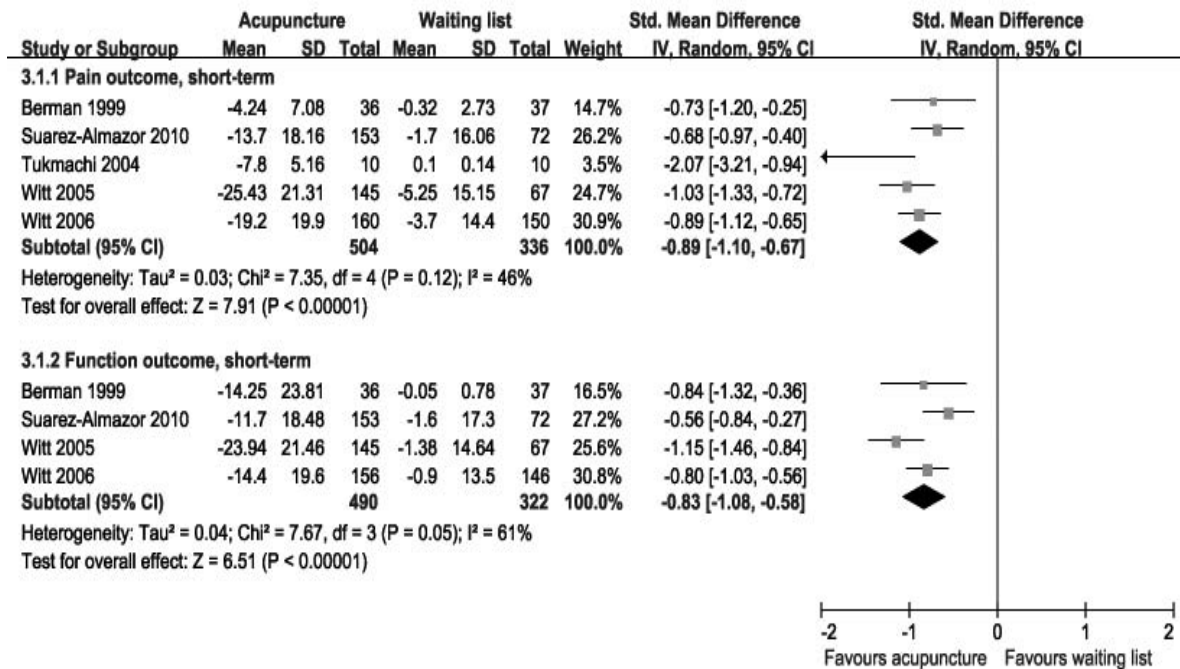Favours acupuncture   Favours waiting list

Figure 5 - Comparison: 3 Acupuncture versus waiting list. Outcome: 3.1 Pain and function, short-term.

all relevant RCTs, which is a limitation in general. In our study, several databases were searched, and there were no restrictions in terms of publication language. Further limitations included the lack and low quality of the primary data and the absence of blinding in the groups treated with standard care. Although 14 RCTs were included, the total is quite small considering the heterogeneity of the overall dataset.

In conclusion, acupuncture was significantly better at relieving KOA pain and preserving function compared with sham acupuncture, standard care, and waiting. Further studies are required to assess the safety and clinical relevance of acupuncture for KOA. For instance, it is necessary to conduct additional RCTs evaluating the cost-effectiveness and longevity of acupuncture, as well as its short- and long-term effects relative to sham acupuncture and other active treatments.

References

1. Peat G, McCarney R, Croft P. Knee pain and osteoarthritis in older adults: a review of community burden and current use of primary health care. *Ann Rheum Dis* 2001; 60: 91-97.

2. Ausiello JC, Stafford RS. Trends in medication use for osteoarthritis treatment. *J Rheumatol* 2002; 29: 999-1005.

3. Bjordal JM, Ljunggren AE, Klovning A, Slordal L. Non-steroidal anti-inflammatory drugs, including cyclo-oxygenase-2 inhibitors, in osteoarthritic knee pain: meta-analysis of randomised placebo controlled trials. *BMJ* 2004; 329: 1317.

4. McGettigan P, Henry D. Cardiovascular risk and inhibition of cyclooxygenase: a systematic review of the observational studies of selective and nonselective inhibitors of cyclooxygenase 2. *JAMA* 2006; 296: 1633-1644.

5. Jordan KM, Arden NK, Doherty M, Bannwarth B, Bijlsma JW, Dieppe P, et al. EULAR Recommendations 2003: an evidence based approach to the management of knee osteoarthritis: Report of a Task Force of the Standing Committee for International Clinical Studies Including Therapeutic Trials (ESCISIT). *Ann Rheum Dis* 2003; 62: 1145-1155.

6. Melchart D, Weidenhammer W, Streng A, Reitmayr S, Hoppe A, Ernst E, et al. Prospective investigation of adverse effects of acupuncture in 97 733 patients. *Arch Intern Med* 2004; 164: 104-105.

7. Manheimer E, Linde K, Lao L, Bouter LM, Berman BM. Meta-analysis: acupuncture for osteoarthritis of the knee. *Ann Intern Med* 2007; 146: 868-877.

8. Ezzo J, Hadhazy V, Birch S, Lao L, Kaplan G, Hochberg M, et al. Acupuncture for osteoarthritis of the knee: a systematic review. *Arthritis Rheum* 2001; 44: 819-825.

9. Kwon YD, Pittler MH, Ernst E. Acupuncture for peripheral joint osteoarthritis: a systematic review and meta-analysis. *Rheumatology (Oxford)* 2006; 45: 1331-1337.

10. DerSimonian R, Laird N. Meta-analysis in clinical trials. *Control Clin Trials* 1986; 7: 177-188.

11. Jubb RW, Tukmachi ES, Jones PW, Dempsey E, Waterhouse L, Brailsford S. A blinded randomised trial of acupuncture (manual and electroacupuncture) compared with a non-penetrating sham for the symptoms of osteoarthritis of the knee. *Acupunct Med* 2008; 26: 69-78.

12. Lansdown H, Howard K, Brealey S, MacPherson H. Acupuncture for pain and osteoarthritis of the knee: a pilot study for an open parallel-arm randomised controlled trial. *BMC Musculoskelet Disord* 2009; 10: 130.

13. Suarez-Almazor ME, Looney C, Liu Y, Cox V, Pietz K, Marcus DM, et al. A randomized controlled trial of acupuncture for osteoarthritis of the knee: effects of patient-provider communication. *Arthritis Care Res (Hoboken)* 2010; 62: 1229-1236.

14. Bellamy N. The WOMAC Knee and Hip Osteoarthritis Indices: development, validation, globalization and influence on the development of the AUSCAN Hand Osteoarthritis Indices. *Clin Exp Rheumatol* 2005; 23(5 Suppl 39): S148-S153.

15. van Tulder M, Furlan A, Bombardier C, Bouter L; Editorial Board of the Cochrane Collaboration Back Review Group. Updated method guidelines for systematic reviews in the cochrane collaboration back review group. *Spine (Phila Pa 1976)* 2003; 28: 1290-1299. Available from URL: http://journals.lww.com/spinejournal/pages/articleviewer.aspx?year=2003&issue=06150&article=00014&type=abstract

16. Berman BM, Singh BB, Lao L, Langenberg P, Li H, Hadhazy V, et al. A randomized trial of acupuncture as an adjunctive therapy in osteoarthritis of the knee. *Rheumatology (Oxford)* 1999; 38: 346-354.

17. Berman BM, Lao L, Langenberg P, Lee WL, Gilpin AM, Hochberg MC. Effectiveness of acupuncture as adjunctive therapy in osteoarthritis of the knee: a randomized, controlled trial. *Ann Intern Med* 2004; 141: 901-910.

18. Foster NE, Thomas E, Barlas P, Hill JC, Young J, Mason E, et al. Acupuncture as an adjunct to exercise based physiotherapy for osteoarthritis of the knee: randomised controlled trial. *BMJ* 2007; 335: 436.

19. Sangdee C, Teekachunhatean S, Sananpanich K, Sugandhavesa N, Chiewchantanakit S, Pojchamarnwiputh S, et al. Electroacupuncture versus diclofenac in symptomatic treatment of osteoarthritis of the knee: a randomized controlled trial. *BMC Complement Altern Med* 2002; 2: 3.

20. Scharf HP, Mansmann U, Streitberger K, Witte S, Kramer J, Maier C, et al. Acupuncture and knee osteoarthritis: a three-armed randomized trial. *Ann Intern Med* 2006; 145: 12-20.

21. Takeda W, Wessel J. Acupuncture for the treatment of pain of osteoarthritic knees. *Arthritis Care Res* 1994; 7: 118-122.

22. Tukmachi E, Jubb R, Dempsey E, Jones P. The effect of acupuncture on the symptoms of knee osteoarthritis--an open randomised controlled study. *Acupunct Med* 2004; 22: 14-22.

23. Vas J, Mendez C, Perea-Milla E, Vega E, Panadero MD, Leon JM, et al. Acupuncture as a complementary therapy to the pharmacological treatment of osteoarthritis of the knee: randomised controlled trial. *BMJ* 2004; 329: 1216.

24. Williamson L, Wyatt MR, Yein K, Melton JT. Severe knee osteoarthritis: a randomized controlled trial of acupuncture, physiotherapy (supervised exercise) and standard management for patients awaiting knee replacement. *Rheumatology (Oxford)* 2007; 46: 1445-1449.

25. Witt C, Brinkhaus B, Jena S, Linde K, Streng A, Wagenpfeil S, et al. Acupuncture in patients with osteoarthritis of the knee: a randomised trial. *Lancet* 2005; 366: 136-143.

26. Witt CM, Jena S, Brinkhaus B, Liecker B, Wegscheider K, Willich SN. Acupuncture in patients with osteoarthritis of the knee or hip: a randomized, controlled trial with an additional nonrandomized arm. *Arthritis Rheum* 2006; 54: 3485-3493.