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Acupuncture for Lowering Blood Pressure: Systematic Review and Meta-analysis

Hyangsook Lee[1,2], Song-Yi Kim[1,3], Jongbae Park[1,4], Yun-ju Kim[3,5], Hyejung Lee[1,3] and Hi-Joon Park[1,3]

BACKGROUND
We conducted a systematic review to estimate the effect of acupuncture on blood pressure (BP) in hypertensive patients.

METHODS
Electronic literature searches for randomized controlled trials (RCTs) of acupuncture were performed in six electronic databases to June 2007 without language restrictions.

RESULTS
Eleven RCTs testing acupuncture either as an adjunct or an alternative met our inclusion criteria and they showed a wide variety of methodological quality, mainly due to poor reporting. Three sham-controlled trials out of 11 studies were statistically pooled: systolic BP (SBP) change was not statistically significant (mean difference −5 mm Hg, 95% CI (−12, 1), $P = 0.12$) and acupuncture only marginally reduced diastolic BP (DBP) by 3 mm Hg (95% CI (−6, 0), $P = 0.05$), but substantial heterogeneity was observed ($I^2 = 92\%$ for SBP, $I^2 = 79\%$ for DBP). When given with antihypertensive medication, acupuncture significantly reduced SBP (−8 mm Hg, 95% CI (−10, −5), $P < 0.00001$) and DBP (−4 mm Hg, 95% CI (−6, −2), $P < 0.0001$) and no heterogeneity between studies was detected. Four studies that investigated acupuncture against antihypertensive medication indicated noninferiority of acupuncture in lowering BP, albeit the quality of them was poor, and their sample sizes were not satisfactory as an equivalence study. Other studies comparing acupuncture with various control procedures had inconsistent findings and most of them were of low methodological quality.

CONCLUSIONS
Considering the limitation of the four positive noninferiority studies and the results of the meta-analysis of the three sham-controlled studies, the notion that acupuncture may lower high BP is inconclusive. More rigorous trials are warranted.

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INTRODUCTION

Approximately one-half of the patients with high blood pressure (BP) are not compliant with drug therapy for various reasons including treatment cost, adverse effects, and complications.[1] Perhaps, for this reason, there has been a growing interest in acupuncture for lowering BP.[2] Acupuncture has long been used for controlling hypertension-related symptoms. Over the past two decades there has been increased understanding of biological mechanisms underlying acupuncture effects. The effects of acupuncture on the cardiovascular system has been reported as the results of the excitation of somatic afferent input, activating sympathetic inhibitory systems in the brain related to endogenous opioids, nociceptin, γ-aminobutyric acid, and serotonin.[3] Several studies have also demonstrated that acupuncture changed the level of BP modulators such as endothelin-1,[4] renin,[5] aldosterone,[6] and angiotension II[7] in hypertensive patients. Meanwhile, clinical trials investigating the efficacy of acupuncture on hypertension have reported conflicting results, yet two reviews supported the use of acupuncture for hypertension.[8,9] Because the previous reviews were not performed systematically, they might have left out some important studies, and new high-quality randomized controlled trials (RCTs) have been recently published.[10,11] Therefore, we decided to conduct a systematic review and a partial meta-analysis on the efficacy of acupuncture for lowering BP. The aim of this review was to systematically summarize and evaluate the effect of acupuncture based on the currently available evidence on lowering BP in the patients with hypertension.

METHODS

Selection of studies. Electronic literature searches were performed in six databases and three relevant journals from their inceptions to June 2007: MEDLINE, EMBASE, Cochrane Central Register of Controlled Trials, China National Knowledge Infrastructure, Korea Institute of Oriental Medicine, National Digital Science Library of Korea databases and journals of Korean Oriental Medical Society, Society for Meridian and Acupoint, and Korean Acupuncture and Moxibustion Society. The search terms used were "acupuncture," "electroacupuncture,"

[1]Acupuncture and Meridian Science Research Center (AMSRC), Kyung Hee University, Seoul, South Korea; [2]Department of Meridian and Acupoint, College of Korean Medicine, Sangji University, Kangwondo, South Korea; [3]Department of Meridian and Acupoint, College of Korean Medicine, Kyung Hee University, Seoul, South Korea; [4]Department of Physical Medicine and Rehabilitation, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, USA; [5]Present address: Korea Centers for Disease Control and Prevention, Seoul, South Korea. Correspondence: Hi-Joon Park (acufind@khu.ac.kr)

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"auricular acupuncture," "blood pressure," and "hypertension." Reference lists from the original articles and reviews were examined for additional studies and no language restrictions were imposed. Studies meeting the following criteria were included: (i) An RCT. (ii) Patients were diagnosed as hypertensive, with a systolic BP (SBP) ≥140 mm Hg and/or a diastolic BP (DBP) ≥90 mm Hg or used antihypertensive drugs. (iii) Patients in the experiment group were treated with acupuncture, electroacupuncture (EA), or auricular acupuncture more than once with or without antihypertensive drugs. (iv) Placebo (sham) or active control procedure was used. Studies were excluded wherein any complementary and alternative therapies of which the efficacy is not yet established (e.g., herbal medicine) were adopted as controls. (v) A change in SBP and/or DBP was an outcome of the trial. Studies were excluded if they were nonrandomized studies and/or involving other forms of acupuncture such as transcutaneous electrical nerve stimulation or laser acupuncture.

The following data were extracted independently by two of the authors (SYK and HJP): first author's name, year of publication, details of participants and trial design, sample size, blinding, intervention procedures, and withdrawals and dropouts. The net changes in SBP and DBP and/or mean BP before and after acupuncture treatment as available were also extracted as main outcome measures. We contacted corresponding authors via e-mail and asked to provide further information if necessary.

Methodological quality assessment. A modified Oxford scale was used to assess the methodological quality of the included studies.[12,13] Points were awarded as follows: if the study was randomized, add one point; add an additional point for appropriate randomization and deduct one point for inappropriate randomization; if the subject was blinded to the intervention (i.e., the control procedure was indistinguishable from real acupuncture), add one point; if the outcome assessor was blinded to the intervention, add one point; if the study described withdrawals and dropouts, add one point. Subject blinding was assumed when the control intervention was indistinguishable from acupuncture, even if the word "blinding" did not appear in the report. A point for assessor blinding was only given if specified in the text. The highest possible score was 5 and trials with ≥4 points were considered to be of high quality whereas trials with ≤3 points were defined as of low quality.

Data analysis. Only studies providing changes in BP were considered for meta-analysis. Meta-analyses were performed using Cochrane Collaboration Review Manager 5 and heterogeneity was sought using I^2 statistic,[14] which describes the percentage of the total variability in study estimates that is due to heterogeneity rather than chance.[15] Mean effect size was calculated using a random effects model as we assume that each study is assessing different acupuncture treatment and thus different effects. χ^2-test or two-tailed Fisher's exact test (SPSS for Windows, ver. 12.0; Chicago, IL) was used to examine any statistically significant associations between direction of study outcome (positive vs. nonpositive for SBP and DBP, respectively) and various factors including study quality (high vs. low as assessed with modified Oxford scale), country where the study was conducted (China vs. non-China), control type (sham vs. medication vs. no treatment), medication (medication vs. no medication), and acupuncture style (individualized vs. standard). Study outcome was defined as positive when acupuncture was significantly more effective than the control and as nonpositive when acupuncture was not significantly different from, or not so effective as the control.

RESULTS

Study characteristics

Eleven RCTs met the inclusion criteria[4,10,11,16–23] (**Figure 1**): seven studies were conducted in China,[4,16–19,22,23] two in Germany,[10,20] and one each in the United States[11] and in Korea.[21] **Table 1** shows the basic characteristics of the included studies. In total, 847 patients (468 in the acupuncture group, 379 in the control group) participated. The number of subjects in each group ranged from 7 to 83 in the acupuncture groups (mean ± s.d., 39.0 ± 21.6) and 7 to 77 in the controls (34.5 ± 19.5). Most studies (91%) except one[20] included both men and women. The mean age was 56.3 ± 7.31, ranging from 40 to 72. The median BP at baseline was ~158/94 mm Hg and 21% of the patients in the acupuncture groups were taking antihypertensive medication. In majority of the included studies, the patients had essential hypertension; three studies involved patients with mild arterial hypertension,[20] mild or moderate arterial hypertension,[10] or BP within or higher than the prehypertension category.[21] BP was measured at various time points, from 1 week to 12 months, with various methods including 24-h ambulatory BP monitoring, mercury sphygmomanometer, and automated sphygmomanometer.

Acupuncture treatment and control characteristics

Participants received 15 to 30 min per session acupuncture treatments 5 to 30 times (median 17) for mean 5.4 weeks (ranging 1 to 8 weeks, median 5.7 weeks). Although two acupuncture modalities were tested, i.e., manual acupuncture,[10,11,16–23] and magnetic needle acupuncture,[4] the acupuncture techniques greatly varied across the studies in terms of acupoint

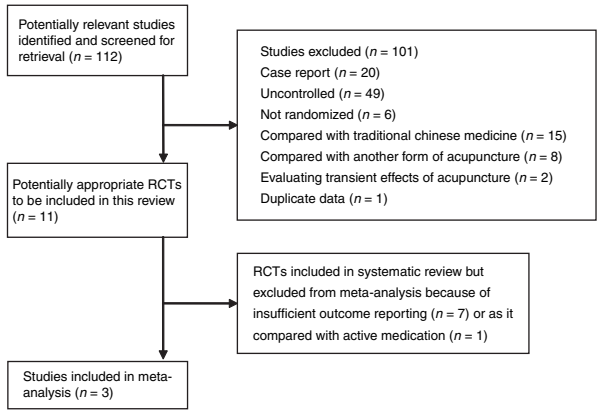

Figure 1 | Study flow diagram. RCT, randomized controlled trial.

Table 1 | Characteristics of included studies

				Acu					Con			
Author	Country	Mean age (Acu/Con)	Quality[a]	Style	No. of session	Duration (wk)	No. of patients (drug%[b])	Baseline BP[c]	Type	No. of patients (drug%[b])	Baseline BP[c]	Comments
Flachskampf[10]	Germany	59/58	4	IND	22	6	83 (=78)	131/81	Sham: identical needling at nonacupoints	77 (=78)	129/80	F/u: 3 and 6 mo
Yin[21]	South Korea	52/54	5	IND	17	8	21 (100)	137/84	Sham: nonpenetrating sham needles at the same acupoints	20 (100)	133/82	Co: breathing and easy-walking exercise for both groups
Macklin[11]	United States	57/56/53	5	IND/ STD	12	5–9.3	64/64 (0/0)	150/93, 150/93	Sham: superficial needling at nonacupoints without manipulation	64 (0)	148/94	F/u: every 2 to 10 wk and 4, 6, 9 and 12 mo
Jin[16]	China	72/69	1	STD	5	1	30 (100)	169/84	Tailored antihypertensive drugs	30 (100)	165/83	Acupuncture group also received tailored antihypertensive drugs.
Wang[17]	China	55/52	2	STD	28	4	30 (0)	170/104	Metoprolol 10 mg (per day)	30 (100)	174/105	
Jiang[4]	China	57/58	1	STD with MNA	18	3	30 (100)	159/92	Captopril 12.5–25 mg (t.i.d.)	30 (100)	157/94	Acupuncture group also received captopril.
Zhao[23]	China	40/46	2	STD	30	5.7	30 (0)	164/96	Lifestyle intervention	30 (0)	161/98	Acupuncture group also received lifestyle intervention
Chen[18]	China	64/65	1	STD	14	2	35 (0)	166/87	Nifedipine 10–20 mg (t.i.d.)	35 (100)	164/90	
Kraft[20]	Germany	50	3	STD	12	6 wk × 2 cycles	7 (0)	148/94[d]	Sham: superficial needling at nonacupoints, deqi elicited	7 (0)	150/94[d]	
Yin[22]	China	ND	1	STD	21	6	48 (0)	171/107	Reserpine 1–2 tablets (t.i.d.)	30 (100)	168/106	F/u: 2 wk
Dan[19]	China	58/58	1	IND	15	3	26 (0)	149/95	Nifedipine 10 mg (t.i.d.)	26 (100)	147/95	

Acu, acupuncture; BP, blood pressure; Co, co-intervention; Con, control; DBP, diastolic blood pressure; F/u, follow-up; IND, individualized acupuncture; MNA, magnetic needle acupuncture; mo, months; ND, no data reported; SA, sham acupuncture; SBP, systolic blood pressure; STD, standardized acupuncture; wk, week; t.i.d., three times a day.
[a]Modified Oxford scale. [b]Percentage of patients on antihypertensive drugs. [c]Mean SBP/DBP. [d]Median.

selection, manipulation or stimulation methods, and frequency and duration of the treatment sessions. Few studies provided detailed information about the practitioner's experience or expertise, treatment rationale, and reproducible description of the intervention, without which the intervention's validity is limited. The most frequently used acupoints were LR3 (7 studies out of 11), LI11 (7 studies), GB20 (7 studies), followed by, ST36 (6 studies), and ST40 (6 studies), with a great variation in combination of selected acupoints. In 4 of the 11 included studies, the acupuncture group also had antihypertensive medication.[4,10,16,21]

Regarding control groups, three types of control procedures were used: sham acupuncture, antihypertensive medications, and no treatment. Defining sham acupuncture as a procedure designed to be indistinguishable from real acupuncture, 4 sham-controlled studies used nonpenetrating sham needle at the same acupoints,[21] identical needling at nonacupoints[10] or superficial needling at nonacupoints.[11,20] Acupuncture was compared with antihypertensive medication in six studies[4,16–19,22] and with no treatment in one study.[23] In two studies, breathing and easy-walking exercise[21] and lifestyle interventions including restricted smoking and alcohol intake, weight reduction, low sodium and calorie intake, exercise, and relaxation[23] were concomitantly given.

Methodological quality

Only two sham-controlled studies were awarded the maximum points of 5 on the modified Oxford scale.[11,21] One RCT received four points as it was not assessor-blinded[10] and another study got three points for being randomized, subject blinding, and reporting of withdrawals and dropouts.[20] The other seven included studies suffered from poor methodological quality of

Table 2 | Findings of included studies

Type of Control	Author	Outcomes	Intergroup difference	ΔSBP		ΔDBP	
				Acupuncture	Control	Acupuncture	Control
				Mean (95% CI)	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
Acu plus Med vs. Sham Acu plus Med	Flachskampf[10]	1. 24-h BP at 6 wk	1. SBP, DBP: each $P < 0.001$	1. −5 (−8, −3)	1. 2 (0, 4)	1. −3 (−5, −2)	1. 1 (−1, 3)
		2. Daytime BP at 6 wk	2. SBP, DBP: each $P < 0.001$	2. −7 (−9, −4)	2. 2 (−1, 4)	2. −4 (−5, −2)	2. 1 (−1, 2)
		3. Nighttime BP at 6 wk	3. SBP: $P = 0.049$; DBP: $P = 0.14$	3. −3 (−6, 0)	3. 0 (−3, 2)	3. −1 (−3, 1)	3. 1 (−1, 3)
		4. Peak exercise[a] BP at 6 wk	4. SBP, DBP: each $P > 0.05$	4. −5 (−11, 2)	4. −1 (−7, 6)	4. −1 (−4, 2)	4. −1 (−6, 3)
	Yin[21]	BP at 8 wk	SBP: $P = 0.013$; DBP: $P = 0.049$	−15 (−20, −9)	−4 (−11, 3)	−7 (−11, −3)	−1 (−6, 4)
Acu vs. Sham Acu	Macklin[11]	BP at 10 wk	SBP: $P = 0.90$, DBP: $P = 0.16$	−4 (−7, 0)	−4 (−8, 0)	−4 (−6, −2)	−3 (−5, −1)
	Kraft[20,b]	1. BP at 10 wk	1. SBP, DBP: each $P > 0.05$				
		2. 24-h BP at 10 wk	2. SBP, DBP: each $P > 0.05$				
		3. Daytime BP at 10 wk	3. SBP, DBP: each $P > 0.05$				
		4. Nighttime BP at 10 wk	4. SBP, DBP: each $P > 0.05$				
Acu plus Med vs. Med	Jin[16]	1. BP at 1 wk	1. SBP, DBP: each $P > 0.05$	1. −31 (NA)	1. −27 (NA)	1. −8 (NA)	1. −8 (NA)
		2. Global symptom changes	2. $P < 0.05$				
		3. Headache, vertigo and	3. Each $P < 0.05$				
		4. insomnia					
	Jiang[4]	BP at 3 wk	SBP, DBP: each $P > 0.05$	−21 (NA)	−12 (NA)	−16 (NA)	−9 (NA)
Acu vs. Med	Wang[17]	1. BP at 4 wk	1. SBP, DBP: each $P > 0.05$	1. −7 (−9, −4)	1. −7 (−9, −5)	1. −14 (−15, −13)	1. −12 (−14, −11)
		2. Improvement of symptoms	2. $P < 0.05$				
		3. Headache, vertigo and agitation	3. Each $P < 0.05$				
		4. Tinnitus and insomnia	4. Each $P > 0.05$				
		5. Serum TNF-α	5. $P < 0.05$				
		6. Plasma ET	6. $P > 0.05$				
	Chen[18]	BP at 2 wk	SBP: $P < 0.05$; DBP: $P > 0.05$	−30 (NA)	−35 (NA)	−9 (NA)	−15 (NA)
	Yin[22]	BP at 6 wk	SBP, DBP: each $P > 0.05$	−35 (NA)	−26 (NA)	−16 (NA)	−14 (NA)
	Dan[19]	1. 24-h BP at 3 wk	1. SBP, DBP: each $P > 0.05$	1. −20 (NA)	1. −20 (NA)	1. −11 (NA)	4.1. −11 (NA)
		2. Myocardial oxygen consumption (SBP × HR)	2. $P < 0.01$				
		3. Symptom relieving	3. $P < 0.05$				
Acu vs. no treatment	Zhao[23]	1. BP at 5.7 wk	1. SBP: $P < 0.05$; DBP: $P > 0.05$	1. −35 (NA)	1. −22 (NA)	1. −15 (NA)	1. −10 (NA)
		2. Fasting insulin	2. $P < 0.05$				
		3. Insulin sensitivity index	3. $P < 0.05$				
		4. Body mass index	4. $P < 0.01$				
		5. Waist hip ratio	5. $P < 0.01$				

Acu, acupuncture; BP, blood pressure; DBP, diastolic blood pressure; ET, endothelin; HR, heart rate; IND, individualized acupuncture; Med, antihypertensive drugs; mo, months; NA, not applicable (data not available); SA, sham acupuncture; SBP, systolic blood pressure; STD, standardized acupuncture; wk, week.
[a]Exercise at the maximal comparable workload. [b]The data of BP changes were not available.

one or two points. Regarding the credibility of a sham control, only one of the three sham-controlled trials checked the success of subject blinding.[11]

BP outcomes and associated factors

As with RCTs of acupuncture in other areas, the included studies greatly varied in terms of baseline BP, acupuncture and control interventions, and the outcome reporting. In some studies, BP changes were not reported: instead, they reported mean BP before and after acupuncture treatment, some even without s.d. or s.e. Changes in BP and summarized outcomes are tabulated (Tables 1 and 2). Overall, 4 of 11 studies yielded a significant BP reduction[10,18,21,23] and the other 7 studies showed no difference between acupuncture and control in

either SBP or DBP changes. High-quality trials showed conflicting results: in two trials, acupuncture was superior to sham[10,21] and in the other study, acupuncture was not significantly different from sham.[11] Although both groups were given antihypertensive medication in the two positive studies,[10,21] the other nonsignificant study compared acupuncture alone with sham acupuncture.[11]

Among seven nonsignificant trials, two studies showed no additional effect of acupuncture when given with antihypertensive medication.[4,16] Four studies compared acupuncture alone with antihypertensive medication,[17–19,22] three of them only provided mean reduction of BP, ranging −21 to −35 mm Hg for SBP and −9 to −16 mm Hg for DBP, whereas antihypertensive medication groups had a SBP change of −20 to −35 mm Hg and −11 to −15 mm Hg for DBP. In one study in which acupuncture plus lifestyle intervention was tested against lifestyle intervention only, acupuncture group had a significantly greater reduction in SBP than the control group (−35 mm Hg vs. −22 mm Hg, $P < 0.05$) but no significant difference was reported for DBP (−15 mm Hg vs. −10 mm Hg, $P > 0.05$).[23]

Most studies were excluded from pooling because of poor data reporting: among the four studies where the changes in SBP and DBP with s.d. were available for meta-analysis, one study was again excluded as it compared acupuncture with active medication,[17] leaving three sham-controlled trials involving four different acupuncture groups for the final analysis (**Figure 2**). Overall, the change in BP was approximately −5 mm Hg for SBP (Mean Difference, 95% CI (−12, 1), $P = 0.12$) and approximately −3 mm Hg for DBP (95% CI (−6, 0), $P = 0.05$), either with or without antihypertensive treatments. The studies were significantly heterogeneous for both SBP (P for heterogeneity<0.00001, I^2=92%) and DBP (P for heterogeneity=0.008, I^2=79%). This significant heterogeneity, however, was eliminated by excluding one trial[11] in which no concomitant medication was given (for SBP, P for heterogeneity = 0.392, I^2 = 0%; for DBP, P for heterogeneity = 0.54, I^2 = 0%). The changes in BP then turned out approximately −8 mm Hg for SBP (95% CI (−10, −5), $P < 0.00001$) and approximately −4 mm Hg for DBP (95% CI (−6, −2), $P < 0.0001$).

Direction of study outcome (positive vs. nonpositive for SBP and DBP, respectively) was not significantly associated with any of the following factors: study quality (high vs. low as assessed with modified Oxford scale (P = 0.491 for SBP, P = 0.055 for DBP), country origin (China vs. non-China) (P = 0.576

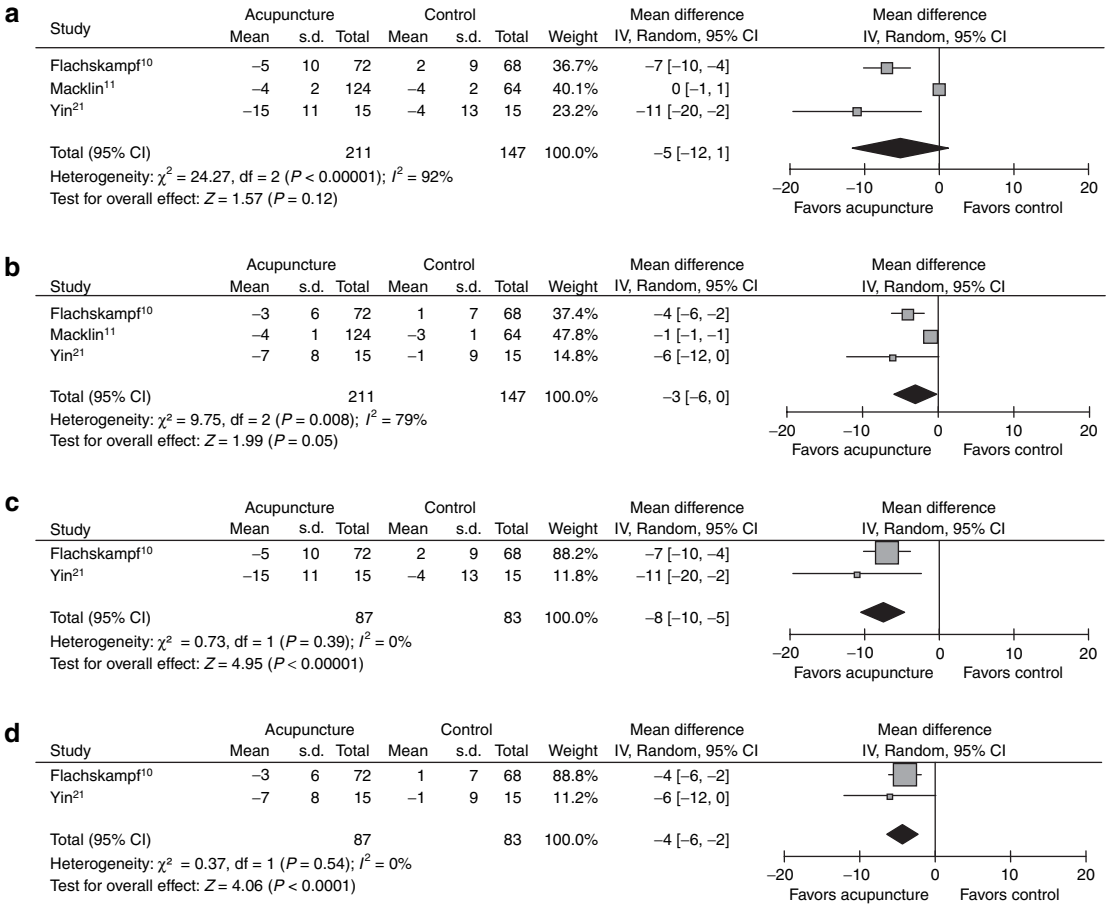

Figure 2 | Pooled estimate of decrement in blood pressure with acupuncture treatment. (**a**) Acupuncture vs. sham acupuncture, outcome: SBP change. (**b**) Acupuncture vs. sham acupuncture, outcome: DBP change. (**c**) Acupuncture plus medication vs. sham acupuncture plus medication, outcome: SBP change. (**d**) Acupuncture plus medication vs. sham acupuncture plus medication, outcome: DBP change. CI, confidence interval; DBP, diastolic blood pressure; SBP, systolic blood pressure.

for SBP, $P = 0.109$ for DBP), control type (sham vs. medication vs. no treatment) ($P = 0.303$ for SBP, $P = 0.291$ for DBP), medication (medication vs. no medication) ($P = 0.303$ for SBP, $P = 0.291$ for DBP), and acupuncture style (individualized vs. standard) ($P = 0.547$ for SBP, $P = 0.091$ for DBP).

Safety

Adverse events were reported in seven studies. Only one study in which patients stopped antihypertensive drugs during study period, reported three cases of serious adverse events during follow-up (two participants experienced hypertensive urgencies in the acupuncture group and one congestive heart failure in the control group).[11] Minor adverse events such as pain,[10] and bleeding at the locus of needling[21] were reported. Four studies reported no acupuncture-related adverse events.[16,19,20,22]

DISCUSSION

Our analysis of three sham-controlled trials showed that real acupuncture only marginally reduced DBP (approximately −3 mm Hg, 95% CI (−6, 0), $P = 0.05$, $I^2 = 79\%$) but not SBP (approximately −5 mm Hg, 95% CI (−12, 1), $P = 0.12$, $I^2 = 92\%$). However, considerable heterogeneity sounds the alarm for any convincing benefit from acupuncture. Limiting the analysis to two trials in which concomitant antihypertensive medication was given to both acupuncture and sham groups resulted in significant BP reductions (−8/−4 mm Hg), without significant heterogeneity between studies ($I^2 = 0\%$). Trials excluded from a meta-analysis tended to yield nonsignificant but inconsistent findings, giving no clear evidence for or against acupuncture.

There always have been criticisms that the acupuncture studies are small and of low methodological quality.[24] The methodological quality of the included trials in our review was from 1 to 5 points on the modified Oxford scale, and they were commonly poorly reported. Seven of 11 studies were excluded from our pooling as most of them failed to report necessary information. Exclusion of trials lacking in analyzable data from our meta-analysis is unlikely to have biased our main finding. Such trials are of poor methodological quality and thus tend to overestimate intervention's effects in both individual trials and meta-analyses.[25,26] Concerns have been also expressed that bias could be introduced by including low quality trials through extensive literature searches.[27] Therefore, it would rather have strengthened the sound conclusion of the review.

Of the 11 included trials, four were in Chinese language and one in German language. An empirical evidence suggests that including publications in languages other than English appears to influence the conclusion of the review only rarely.[27] In addition, certain Asian countries are reported to be more likely to publish positive results in acupuncture research.[28] Nevertheless, including all the relevant trials meeting the predefined inclusion criteria in the systematic review through more comprehensive database search keeps the review unbiased. In areas of complementary and alternative medicine with which East-Asian countries are culturally more familiar than Western countries, it may be more important to obtain and assess unpublished or hard-to-locate non-English studies to get a sound decision. Constructive criticism of low-quality trials should help to rediscover under-researched areas leading to better studies in the future. In our review, no association between country where the trial was conducted and direction of the outcome was detected: all Chinese trials equally demonstrated no significant difference between acupuncture and control and only two trials reached a statistical significance for SBP only.[18,23] This may be due to the control type—~86% of the Chinese studies compared acupuncture with antihypertensive drugs. As acupuncture only vs. medication trials showed no significant difference, one may roughly overestimate that acupuncture may lower BP as much as antihypertensive drugs but this should be interpreted with caution. As none of these trials were designed as active control, equivalence trials, it is not certain that acupuncture may or may not have equivalent effects to antihypertensive drugs.

Interestingly, acupuncture alone reduced BP similarly as antihypertensive medication leading to no significant results but when given *with* medication, acupuncture seems to have little additional effect.[4,17] This is contradictory with the results from sham-controlled high-quality trials in which acupuncture significantly reduced BP only if given *with* medication.[10,21] This may be due to higher mean baseline BP (134/83 mm Hg vs. 164/88 mm Hg) or treatment period (6–8 weeks vs. 1–3 weeks) which could be too short to induce any further reduction: Yin *et al.* reported no significant BP change at 4 weeks after acupuncture but at 8 weeks BP significantly reduced.[21]

Recommendations for future research

The studies included in our review demonstrated majority of the problems that had been pointed out by other reviews on acupuncture,[24] e.g., patients meeting various criteria, heterogeneous comparison groups and endpoints making statistical pooling impossible or less informative, and small sample size (average 35) resulting in questionable validity. Further studies to test the BP-lowering effect of acupuncture should consider such shortcomings. There remain a lot of unanswered research questions: what patient population would acupuncture benefit the most?; which acupuncture treatment would be optimal?; should acupuncture be given as an adjunct to antihypertensive medication?; the trials uniformly assessed BP, a good surrogate for risk of cardiovascular diseases,[29] but none of them assessed the primary outcomes of interest such as heart attacks, strokes, or deaths—is there a role of acupuncture from the point of view of cardiovascular prevention? We definitely need more rigorous studies to answer these research questions and establish acupuncture's role in hypertension.

Perspectives

In summary, evidence to date does not support acupuncture treatment to reduce BP. Although two high-quality sham-controlled trials favor real acupuncture over sham treatment and four antihypertensive drug–controlled trials found no difference between acupuncture alone and active medication, small numbers and poor reporting should be carefully considered before jumping into a promising conclusion. Well-documented studies adopting rigorous methodology are warranted.

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