

## Effect of acupuncture on blood pressure control in hypertensive patients

Vilaval Termklinchan, Sasinan Wasin, Mayuree Choesomboon, Chananun Praditbatuka, Somchai Sukareechai

**Vilaval Termklinchan, Sasinan Wasin, Mayuree Choesomboon, Chananun Praditbatuka, Somchai Sukareechai**, Thai Traditional and Alternative Medicine Unit, Department of Family Medicine, Panyanantaphikkhu Chonprathan Medical Center, Srinakharinwirot University, Nonthaburi 11120, Thailand

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**Correspondence to: Dr. Vilaval Termklinchan**, Thai Traditional and Alternative Medicine Unit, Department of Family Medicine, Panyanantaphikkhu Chonprathan Medical Center, Srinakharinwirot University, Nonthaburi 11120, Thailand. drple22@gmail.com

**Telephone:** +6686-711-5224

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**RESULTS:** SBP of the 40 cases in the acupuncture group significantly improved compared to the medication only group [ $Z = -4.265$ ,  $P$  (2-tailed) = 0.001] and DBP of acupuncture group was lower than that of the control group ( $Z = -2.813$ ,  $P = 0.005$ ). mABP of acupuncture group was the marked improvement in the reduction of blood pressure to that of medication group in controlling blood pressure. ( $Z = -2.416$ ,  $P = 0.016$ ).

**CONCLUSION:** These results indicate that the effectiveness of acupuncture with the acupuncture group is superior to the only medication group in the control of hypertension.

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**Keywords:** Hypertension; Acupuncture; Amlodipine; Blood pressure

### Abstract

**OBJECTIVE:** To study the effect of acupuncture on blood pressure (BP) control in hypertensive patients.

**METHODS:** A total of 80 out-patients with primary hypertension at the family medicine unit and the social security unit were randomly and equally divided into an acupuncture plus medication group and a control group that received only medication. Patients of the acupuncture group were treated with acupuncture stimulation of Yinlingquan (SP 9), Zusanli (ST 36), Taichong (LR 3), Hegu (LI 4), Quchi (LI 11), Neiguan (PC 6) for 30 min, once per week, continuously for eight weeks. In addition, both groups received amlodipine (5 mg) once daily, continuously for eight weeks. Systolic BP (SBP), diastolic BP (DBP) and mean arterial BP (mABP) were recorded. Data were analyzed by Mann-Whitney  $U$  test.

### INTRODUCTION

In Traditional Chinese Medicine, acupuncture has been used for 2000 years to treat many patients. World Health Organization (WHO) accepts that many diseases and symptoms can be cured by acupuncture. There are many randomized control trials to support them. Hypertension is one of them where acupuncture may control blood pressure in a hypertensive patient.<sup>1</sup> However, until now, it is still under study to prove its use. Acupuncture is a method in which a sterile needle is penetrated through the skin and the patient feels a heavy sensation called "De Qi". Qi will pass through the needle to the affected organ, and is removed after 30 min. Acupuncture can help vessels and arteriole dilatation and eliminates waste products.<sup>2-4</sup> Acupuncture can stimulate peripheral nerves to pass through pathways to the neuron centers in cerebral cortex and hypo-

thalamus to control many important organs by the autonomic nervous system.<sup>5-8</sup> Moreover, acupuncture can stimulate many neurotransmitters especially endorphins that can control pain like morphine.<sup>9-13</sup> Also, acupuncture can stimulate the secretion of hormones, for example, ACTH and corticosteroid, that decrease the inflammation of tissue and promote circulation.<sup>11-13</sup> In the immune system, acupuncture can stimulate the secretion of antibodies to improve the immune system of a healthy person.<sup>13-15</sup> In addition, acupuncture has biphasic effect in that acupuncture can balance many organs from hypofunction to normofunction or hyperfunction to normofunction.<sup>8,13-15</sup>

Hypertension is a very common disease in the Thai population especially older people.<sup>16</sup> Hypertensive patients have many complications and a high mortality rate. In JNC VIII (The Eighth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure) guideline recommended starting non-pharmacological intervention first because of the side effects of medication.<sup>17</sup> Thus, acupuncture is an alternative treatment that may help to control blood pressure in hypertensive patients. A study was conducted to estimate the effect of acupuncture on blood pressure (BP) control in hypertensive patients.

## MATERIALS AND METHODS

This study was a single-blind randomized controlled trial conducted by a statistician who was not involved in the study using a computerized program. Patients were assigned by block randomization to one of the two groups. BP was measured by an outside screening nurse that did not know each group. But it was not possible to conceal the treatment group from patients because of the intervention. A total of 90 outpatients with primary hypertension at the family medicine unit and the social security unit were equally divided into an acupuncture plus medication group and only medication group. Patients who were diagnosed with primary hypertension grade 1 [defined as systolic BP (SBP) more than or equal to 140-159 mm Hg, diastolic BP (DBP) more than or equal to 90-99 mm Hg],<sup>16</sup> no cardiovascular disease, and not taking any antihypertensive drugs were recruited to participate in the study. Patients who had a history of bleeding disorders or had contraindication of acupuncture (active dermatological lesions or wound lesion at acupuncture site, receiving antiplatelet or anticoagulant drugs, pregnant woman), or diabetic patients, hypertension grade 2-3, as well as heart and kidney failure were excluded from the study. The study was done according to the standard guidelines for the treatment of Hypertension for Thai Hypertension Society. The study was approved by The Ethics in Human Research Review Committee of Panyanathaphikhu Chonprathan Medical Center Srinakharin-

wirot University, SIDCER-FERCAP (approval No. 00355). Written informed consents were obtained from all participants before their enrollment into the study.

After enrollment, demographic characteristics including age, sex, weight, height were recorded by a nurse. Body mass index (BMI) was calculated as the ratio of weight/(height)<sup>2</sup> (kg/m<sup>2</sup>). SBP, DBP and mean arterial BP (mABP) were recorded. Every patient was to rest for 5 min before BP measurement. Their BP was measured 3 times with 2 min interval and the mean value was calculated. The adverse reaction was observed during the study.

Patients were randomized into one of the 2 groups, forty-five patients in group 1 (acupuncture group: acupuncture with an antihypertensive drug) used disposable silver needles (0.25 mm × 40 mm) at 12 acupuncture points including Yinlingquan (SP 9), Zusanli (ST 36), Taichong (LR 3), Hegu (LI 4), Quchi (LI 11), Neiguan (PC 6), for 30 min per session. After each session, the needles were removed. Patients were treated for 1 session per week for 8 consecutive weeks. Every patient received amlodipine 5 mg once daily. Forty-five patients who were assigned to group 2 (medication group or control group: an antihypertensive drug only) that received 5 mg amlodipine as well as group 1. No acupuncture treatment was provided for this group. Patients in this group were followed up in 4 weeks/time for 2 times, continuously for 8 weeks. Patients in both groups were instructed to maintain their normal daily activity with minimal calorie intake, lifestyle modification, and exercise during the study period.

### Outcome measurement

After 8 weeks, the outcome was that the median of SBP, DBP and mABP in both groups with 90% power and two-tailed alpha error of 0.05. We collected minimum and maximum data. We enrolled 45 patients per group in accounting for possible 10% follow-up loss.

### Statistical analysis

Normally distributed variables were descriptively presented as mean ± standard deviation ( $\bar{x} \pm s$ ), median, minimum and maximum. Non-parametric statistical were used. The outcome was compared at the end of the study and the baseline. The Mann-Whitney *U* test and Wilcoxon signed rank test were used for SBP, DBP, mABP. Statistical analysis was performed using STATA software (STATA for Windows, release 13, Texas, USA). *P* value < 0.05 was considered statistically significant.

## RESULTS

Data from a completed group of 80 patients (40 in the acupuncture group and 40 in control group) (Figure 1). Baseline demographic characteristics are shown in Table 1. The half of the patient were men (53.8%) with the median age of 50.5 years (range

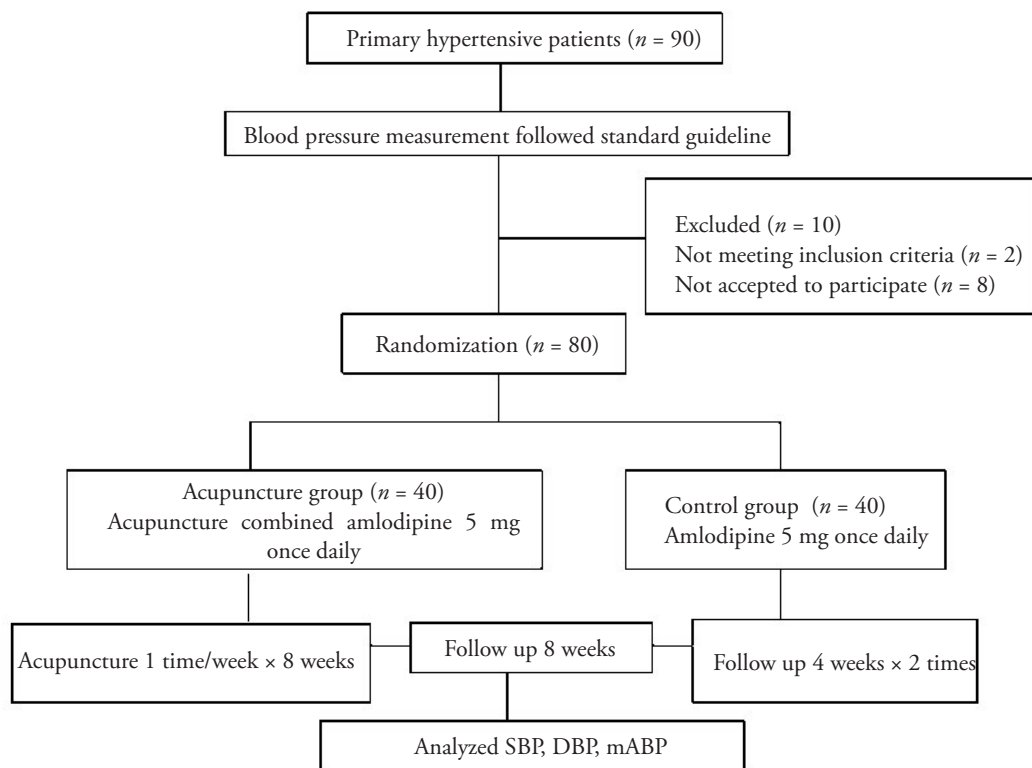


Figure 1 Flow chart

SBP: systolic blood pressure; DBP: diastolic blood pressure; mABP: mean arterial blood pressure.

33-71) in the acupuncture group, 49 years (range 38-70) in control group. There were no significant differences in terms of baseline demographic characteristics including age, sex, weight and BMI among the study groups. The median of SBP in the acupuncture group and control group were 155.5 and 153 mm Hg, respectively ( $P = 0.29$ ). The median of DBP in the acupuncture group and control group were 91 and 90 mm Hg, respectively ( $P = 0.33$ ). Baseline SBP, DBP were not significantly different between groups in Table 1.

At the end of treatment (8 weeks), SBP, DBP and mABP in the acupuncture group was significantly lower than in control group. The median of SBP in acupuncture group and control group were 124 and 136.5 mm Hg, respectively ( $P = 0.001$ ). The median of DBP in acupuncture group and control group were 73 and 78.5 mm Hg, respectively ( $P = 0.005$ ). The median of mABP in acupuncture group and control group were 90.5 and 98 mm Hg, respectively ( $P = 0.016$ ) (Table 2).

SBP of the 40 cases in the acupuncture group was decreased significantly compared to the medication only group ( $P < 0.05$ ) and DBP of acupuncture group has also significantly decreased compared to the other group ( $P < 0.05$ ). The mABP of acupuncture group showed marked improvement in the reduction of BP compared to that of medication group in controlling BP ( $P < 0.05$ ). Therefore, SBP, DBP and mABP in the acupuncture group were significantly lower than in the control group. No serious adverse events were reported. Only 2 patients had minimal bleeding and pain.

## DISCUSSION

This study demonstrates that acupuncture and medication groups were effective in lowering BP for eight weeks in each hypertensive group. After treatment SBP, DBP, mABP in acupuncture plus medication group were significantly lower than the medication group.

Kalish *et al.*<sup>18</sup> studied "Stop Hypertension with the Acupuncture Research Program" at New England Research Institutes, USA. Their study found that the therapeutic efficacy of acupuncture in reducing BP level of stage 1-2 hypertensive patients in 3 groups, but each group differs in acupuncture points and techniques in each person. Every group stopped their medication. Our study uses only the same technique for acupuncture group and still go on with medication in both groups.

In addition, Macklin *et al.*<sup>19</sup> found out that acupuncture can reduce both SBP and DBP, followed up in 6 weeks, with an interval of 2 times/week. In most published studies, acupuncture can decrease BP that used different duration, the interval of follow-up, the number of sessions and acupuncture points. Yin *et al.*<sup>20</sup> studied in pre-hypertensive patients that real but not shammed acupuncture can reduce BP. This study had a follow-up period similar to our study. Our study did only the stage of 1 hypertensive patients but does not include pre-hypertension.

Lee *et al.*<sup>21</sup> collected 11 systematic reviews and meta-analysis about acupuncture for lowering BP. Many studies had some limitations and outcomes of only acu-

Table 1 Baseline characteristics in two groups

Item	Acupuncture (n = 40)			Control (n = 40)			Mann-Whitney U	P value
	Min	Max	Median	Min	Max	Median		
Age (years)	33	71	50.5	38	70	49	693	0.303
Weight (kg)	37	94	63.75	45	90	66	749	0.627
BMI (kg/m <sup>2</sup> )	16	32	24	20	37	24	759	0.697
SBP (mm Hg)	141	159	155.5	140	159	153	691	0.290
DBP (mm Hg)	81	99	91	60	99	90	700	0.333
mABP (mm Hg)	105	119	111	86	119	112	694	0.306

Notes: both groups were given amlodipine 5 mg once daily. 12 acupuncture points were done in only acupuncture group. Acupuncture group was treated every week for consecutive 8 weeks. The control group was followed up in 4 weeks per time for 2 times, continuously for 8 weeks. BMI: body mass index; SBP: systolic blood pressure; DBP: diastolic blood pressure; mABP: mean arterial blood pressure. Overall the Mann-Whitney U test and Wilcoxon signed rank test were not statistically significant.

Table 2 Clinical outcomes of SBP, DBP and mABP in two groups (mm Hg)

Item	Acupuncture (n = 40)			Control (n = 40)			Mann-Whitney U	P value
	Min	Max	Median	Min	Max	Median		
SBP	103	149	124	108	166	136.5	357	0.001
DBP	58	91	73	53	100	78.5	508	0.005
mABP	73	106	90.5	71	122	98	549	0.016

Notes: both groups were given amlodipine 5 mg once daily. 12 acupuncture points were done in only acupuncture group. Acupuncture group was treated every week for consecutive 8 weeks. The control group was followed up in 4 weeks per time for 2 times, continuously for 8 weeks. SBP: systolic blood pressure; DBP: diastolic blood pressure; mABP: mean arterial blood pressure. Nonparametric techniques (the Mann-Whitney U test and Wilcoxon signed rank test) were statistically significant ( $P < 0.05$ ).

puncture group in SBP and DBP not effective ( $P > 0.05$ ). But acupuncture combined with medication can be effect in decreasing SBP and DBP ( $P < 0.05$ ). However, there is still no concrete conclusion evidence that acupuncture can lower BP.

This study has some limitations. Small sample size and only stage 1 hypertensive patients are one of the limitations of this study. We estimated that a sample size of 40 participants per group to detect the significant improvement with 90% power and two-tailed alpha error of 0.05 will be more beneficial. The small sample size also makes our discussions about lowering BP. Finally, all participants were advised to DASH diet consumption. In conclusion, acupuncture combined with medication has significantly superior efficacy to decrease SBP, DBP, and mABP in hypertensive patients compared to only medication. However, further studies with larger number of subjects as well as many stages of hypertensive patients can provide a further understanding of the issue.

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