

**SOUTH BAYLO UNIVERSITY**

**ACUPUNCTURE IN THE TREATMENT OF HYPERTENSION:  
A LITERATURE REVIEW**

**By**

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**A RESEARCH PROJECT SUBMITTED  
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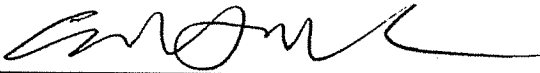
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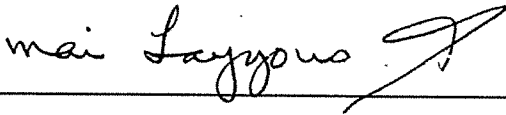
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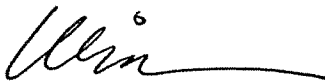
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**Abstract**

High blood pressure is commonly seen in medical settings. According to statistics, 26.4% of adults worldwide had high blood pressure in 2000, and the total hypertensive population is estimated to reach 1.56 billion by 2025. Recognized by the World Health Organization (WHO), acupuncture is a therapy suitable for treating early essential hypertension in addition to the conventional medication. Clinically, the utility of acupuncture for hypertension remains controversial in light of researches and trials. Due to the demand in practice and the significance of the health issue, this article discusses an exploration of the effectiveness and consistency of acupuncture in lowering blood pressure and its clinical potential by a narrow literature review. In spite of the disparities of improvements and statistic significance, research articles showed both sham and real acupuncture, including point Quchi LI-11, demonstrated a potential of lowering blood pressure. Accordingly, the effect of Quchi LI-11 in lowering blood pressure and other underlying mechanisms of acupuncture deserve further investigation. Because of the

complexity of TCM diagnosis and the disunity of treatment plans in clinicians, the author concluded that more conscientious clinical trials built on various trial modes and proven physiologic rationales are desired to explicate acupuncture's efficacy in terms of Western medicine. The perspective of the clinical utility of acupuncture in treating hypertension, particularly in combination with antihypertensive agents, deserves more research as well.

**Keywords:** acupuncture, essential hypertension, high blood pressure

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## I. INTRODUCTION

Arterial hypertension is a common health concern in medical settings as well as a cardinal public health challenge worldwide. Globally, 26.4% of the adult population had hypertension in 2000, and the total number is predicted to reach 1.56 billion by 2025.<sup>1</sup> Persistent and uncontrolled hypertension can lead to deterioration of the body's health condition and is a risk factor for hypertensive heart disease. Although pharmaceuticals are the most widely used treatment for hypertension in Western medicine, antihypertensive drugs have been known to cause side effects and discomfort in patients.

Alternatively, the World Health Organization (WHO) recognizes that acupuncture is suitable for treating early essential hypertension.<sup>2</sup> Controversies about this appear in the literature—some support acupuncture's benefit in lowering blood pressure, while others presented adverse findings. Therefore, a rigorous survey on literature discussing these different findings is conducive to the assessment of acupuncture's utility in treating hypertension. To serve that purpose, this project was designed to explore the efficacy and consistency of acupuncture in reducing blood pressure from the evidence of clinical trials conducted in the twenty-year period between 1990 and 2009.



## II. METHODOLOGY

Electronic searches were implemented on the PubMed and Google Scholar databases using the key words “acupuncture” with “hypertension” and “blood pressure.” PubMed databases indexed by Entrez were searched via the “clinical queries” tool and narrowed down to the “therapy categories” with a “broad, sensitive scope” on the above key words. To identify additional articles that could meet the criteria, Google Advanced Scholar Search was performed to find the above key words in article titles. The timeframe of article publication was set between January 1990 and December 2009. Recruited studies centered on acupuncture treatments for hypertension, either as the main procedure or an adjunctive modality.

Subjects enrolled for the trials included individuals without hypertension and patients diagnosed with essential hypertension. Cited articles in the reference list of each literature were also scanned. The language of publication was restricted to English only. Criteria modified from the Jadad instrument were used to assess the methodological quality of randomized controlled trial (RCT) articles.<sup>3</sup> Thus, literature selected for final review must be randomized, blinded (single or double, as it is difficult to be double blinded in an acupuncture trial), and well-described on withdrawals and dropouts. In addition, they needed to provide details of validated outcomes, clear hypothesis and objectives, defined inclusion and exclusion criteria, and proper power calculation.

### III. RESULTS

The primary retrieval of articles returned a total of sixty-one headings from PubMed. After including additional literature from Google Scholar and excluding irrelevant and non-clinical studies, four reports on clinical observations and eight RCTs were identified for further evaluation.<sup>4,5,6,7,8,9,10,11</sup> As lack of methodological quality has been a major criticism in acupuncture trials, this project sifted the quality of trials prior to the final review. Through extensive research the reports of clinical observation,<sup>4,5,6,7</sup> some translated from foreign languages, were weeded out to avoid biases possibly introduced by including low quality articles or misinterpretation. The further screening process indicated that among the eight RCTs, one did not report the details of randomization and dropouts, and three failed to come to a sufficient sample size for appropriate power calculation.<sup>8,9,10,11</sup> As a result, only four RCTs met the criteria of methodological quality set above and were included for the present review.<sup>12,13,14,15</sup> The characters of included RCTs are described in the table and elucidated below.

Table 2: Characters of RCTs Included in the Literature Review

Authors	Macklin et al. (SHARP)	Yin et al.	Flachskampf et al.	Zhang et al.
Year of Publication	2006	2007	2007	2009
Sample Size and Subject Data	<ul style="list-style-type: none"> <li>• 192 (188 finished trial)</li> <li>• Mean age 56.8±8.4, 55.9±10.6, and 53.2±9.5 in the individualized, standardized, and controlled groups respectively</li> </ul>	<ul style="list-style-type: none"> <li>• 41 (30 finished trial)</li> <li>• All on hypertensive drugs</li> <li>• Mean age 52 for the acupuncture and 54 for the sham group</li> </ul>	<ul style="list-style-type: none"> <li>• 160 (140 completed treatments, 133 attended all 3 follow-ups)</li> <li>• Mean age 58.8±8.2 and 58.0±7.9 for active and sham groups respectively</li> </ul>	<ul style="list-style-type: none"> <li>• 27 (No withdrawal)</li> <li>• Normal or with mild hypertension, mean age 25±5</li> </ul>
Research Methods	<ul style="list-style-type: none"> <li>• Individualized (with TCM diagnosis &amp; treatment) &amp; standardized (treated with pre-selected points) groups vs. sham treatment</li> <li>• Individualized group diagnosed with 5 TCM hypertension patterns</li> <li>• Non-meridian points used for the control group</li> <li>• Up to 12 sessions in</li> </ul>	<ul style="list-style-type: none"> <li>• Real acupuncture vs. sham acupuncture, along with daily breathing and easy-walking exercises.</li> <li>• 4 acupuncture formula based on diagnosis of constitutional energy traits used for the real acupuncture group</li> <li>• 17 sessions with 3~4-day intervals in 8 wks</li> </ul>	<ul style="list-style-type: none"> <li>• TCM diagnosis and treatment vs. sham acupuncture</li> <li>• 3 BP lowering points bilaterally for TCM group, 3 irrelative points for sham group</li> <li>• 22 sessions 30 minutes each in 6 weeks</li> <li>• Single blinded</li> </ul>	<ul style="list-style-type: none"> <li>• Only <i>Hegu</i> LI-4 and <i>Quchi</i> LI-11 used for the trial</li> <li>• Hans electrical acupuncture vs. sham treatment without electrical stimulation</li> <li>• 30 minutes per session twice a week for 5 weeks</li> <li>• Single blinded</li> </ul>

	<p><b>6~8 weeks</b></p> <ul style="list-style-type: none"> <li>• <b>Double blinded</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Double blinded</b></li> </ul>	<p>Mean 24-hour ambulatory systolic and diastolic blood pressures in the TCM group decreased significantly but returned to pre-treatment levels after.</p>	<p>Electrical stimulation of acupuncture points significantly reduced systolic but not diastolic blood pressure in subjects with normal or elevated blood pressure.</p>
<p><b>Outcomes</b></p>	<p>From baseline to 10 weeks, systolic and diastolic blood pressures decreased not significantly with individualized TCM, standardized, and sham acupuncture.</p>	<p>From baseline to 8 weeks, systolic and diastolic blood pressures decreased significantly in the real acupuncture group but not in the sham group.</p>	<p>• 24-hour &amp; daytime BP reduction: Systolic P &lt; 0.001 Diastolic P &lt; 0.001</p> <p>• Nighttime BP reduction: Systolic P = 0.049 Diastolic P = 0.14</p>	<p>BP decrease in active acupuncture with electrical stimulation vs. controlled group without electrical stimulation: Systolic P &lt; 0.05 Diastolic P &gt; 0.05</p>
<p><b>P value</b></p>	<ul style="list-style-type: none"> <li>• BP declines in individualized &amp; standardized combined vs. sham groups: Systolic P = 0.90 Diastolic P = 0.16</li> <li>• BP decline in individualized vs. sham groups: Systolic P = 0.91 Diastolic P = 0.14</li> </ul>	<p>Acupuncture with Korean medicine diagnosis vs. sham acupuncture: Systolic P = 0.013 Diastolic P = 0.049</p>		

**Note: It is considered statistically significant if the p value is 0.05 or smaller.**

Flachskampf et al. randomized 160 outpatients in a trial comparing TCM acupuncture with sham treatment.<sup>12</sup> According to one of four TCM types of hypertension, acupuncture points were selected for the experimental group from Hegu LI-4, Quchi LI-11, Zusanli ST-36, Fenglong ST-40, Sanyinjiao SP-6, Yinlingquan SP-9, Ganshu BL-18, Shenshu BL-23, Taixi KID-3, Neiguan P-6, Fengchi GB-20, Xingjian LIV-2, Taichong LIV-3, Baihui DU-20, Guanyuan REN-4, Qihai REN-6, and Zhongwan REN-12. Three corporeal points were needled bilaterally for 30 minutes in each session, while *Taiyang* point was needled unilaterally only if used. The control group was treated with an identical number, distribution, and duration of session regardless of TCM hypertension typology, except that needling was performed on points irrelative to blood pressure reduction as per TCM concepts. The results showed that mean 24-hour ambulatory systolic and diastolic blood pressures decreased significantly after treatment in the TCM group. However, at three and six months from the baseline, the mean systolic and diastolic blood pressures returned to pre-treatment levels.

The result of a smaller RCT supported that acupuncture lowered systolic blood pressure. In a trial with 27 normal or mildly hypertensive young people, Zhang et al. reported that electrical stimulation on acupuncture points Hegu LI-4 and Quchi LI-11 can reduce systolic, but not diastolic blood pressure.<sup>13</sup> Compared with the sham group receiving treatment with no power output from the Hans electrical stimulator, the real electrical acupuncture group was treated twice a week for five weeks and significantly reduced systolic blood pressure after ten treatments. However, neither group attained a significant decline of diastolic blood pressure after treatments.

As to the application of acupuncture in addition to the conventional antihypertensive management, Yin et al. reported that acupuncture is promising as an adjunctive therapy.<sup>14</sup> Forty-one patients, all on hypertension medicine, were randomly divided into real acupuncture and non-invasive sham groups. Interventions included acupuncture at an interval of three to four days for eight weeks and daily ten minute breathing and 30 minute easy-walking exercises, with medication remaining the same. According to the constitutional energy traits in Korean medicine, acupuncture formulas were pre-made into four categories for trial subjects: Zusanli ST-36, Quchi LI-11, and Dachangshu BL-25 (the Large Intestine type); Taibai SP-3, Taiyuan LU-9 and Feishu BL-13 (the Lung type); Fuliu KID-7, Dahe KID-12 and Guanyuan REN-4 (the Kidney type); and, Shangyang LI-1, Dazhui DU-14, and Fengchi GB-20 (the Urinary Bladder type). In the end, the real acupuncture group demonstrated a significant decrease in systolic and diastolic blood pressures at eight weeks.

In the Stop Hypertension with Acupuncture Research Program (SHARP), the largest study of its kind up to now, Macklin et al. conducted the trial in compliance with rigorous methodology requirements and TCM principles.<sup>15</sup> One hundred ninety-two participants were enrolled and randomly assigned to three groups: individualized acupuncture with TCM diagnosis, standardized treatment with pre-selected points, and invasive sham acupuncture. The TCM groups were further divided into five patterns according to TCM diagnosis such as flare up of *liver fire*, *liver yang* rising with *kidney yin* deficiency, obstruction of *phlegm* and *dampness*, *yin* and *yang* deficiency, and *qi* and blood deficiency leading to *liver yang* rising.

Distinct clinicians were designated to conduct diagnosis and treatments for the blinding purpose. Each participant received twelve or fewer treatments in six to eight weeks. The blood pressure was recorded and analyzed from the baseline through the tenth week. For each participant in the individualized group, experienced TCM practitioners needled ten to twelve points bilaterally including Fengchi GB-20, Quchi LI-11, Taichong LIV-3, Sanyinjiao SP-6, Zusanli ST-36 and ear points Heart and *Jiang Ya Gou*, with electrical stimulation. For the standardized subjects, pre-selected points from the above list were used regardless of TCM diagnosis. In the control group, needles were inserted in five bilateral points not on any TCM meridians or locations in ears of non-specific function without stimulation. Final results indicated the mean values decreased from baseline to the tenth week, but it did not differ significantly between participants randomly assigned to individualized and standardized groups versus sham acupuncture. Thus the authors concluded that both real and sham acupuncture lower blood pressure, but individualized and standardized approaches provide no greater benefits than invasive sham acupuncture.

#### IV. DISCUSSION

The causes of essential hypertension remain unknown and signs are still unclear, therefore clinical trial designs and results varied greatly. Some findings suggested that acupuncture is effective to lower blood pressure.<sup>4,5,6,7</sup> At least one concluded with a small fall of blood pressure immediately after each treatment but not persistent.<sup>11</sup> Commentaries of review articles presented debatable conclusions indicating that research trials were insufficient in evidence,<sup>16</sup> reported inconclusive effects,<sup>17</sup> or demonstrated a

potential as a non-pharmacological intervention.<sup>18</sup> Since essential hypertension is often pain and symptom free and related to life patterns, treatments of TCM scope are usually holistic, emphasizing the improvement of quality of life but overlooking the numeric blood pressure. The difference in the administration of this health condition presents a major challenge to conduct clinical trials of acupuncture for hypertension.

First of all, the great complexity of constructing diagnosis and treatment procedures in the TCM manner may lead to various point selection and intervals in practitioners and, in turn, difficult result measurement. For example, in hypertensive patients with a TCM diagnosis of deficiency types or obstruction of *phlegm* and *dampness*, it possibly takes much longer than a trial period before a satisfactory result accrues. Furthermore, among the experiment groups in this present review, whether acupuncture was conducted in line with TCM or Korean medicine or acupuncture points were pre-selected without a diagnosis, Quchi LI-11 was a common point selected for treatments regardless of treatment arms or constitutions.<sup>12,13,14,15</sup> Accordingly, the fact that blood pressures were lowered in all RCTs with Quchi LI-11 implies that the specific effect of this acupuncture point is by far independent of diagnosis or acupuncture constitution. To investigate the reliability of Quchi LI-11 in regulating blood pressure, further trials with disparate research modes are needed.

Second, the magnitude of interrelation between acupuncture and antihypertensive agents and possible placebo effects cannot be ignored. Due to the ethics and scope of practice involved, in acupuncture trials it is not possible to remove medication on subjects who are already prescribed. Yet participants in three RCTs (Flachskampf, Yin, and Macklin) continued taking prescribed pharmaceuticals while receiving acupuncture



treatments. Nevertheless, Flachskampf conjectured that acupuncture may offer an alternative to antihypertensive drugs,<sup>12</sup> Yin concluded that acupuncture has an add-on effect to medicine as an adjunctive therapy,<sup>14</sup> and Macklin suggested that further research is necessary to study the combination of acupuncture and prescription drugs to enhance the clinical management of hypertension.<sup>15</sup> Therefore, further research is encouraged to investigate the clinical utility of acupuncture in combination with pharmaceuticals.

The mechanisms underlying acupuncture's effects of lowering blood pressure are not fully understood, but proposing a meaningful physiologic rationale can help investigators to develop and test a causal hypothesis, choose an appropriate control, and rule out placebo effects.<sup>19</sup> Besides the possible effect of Quchi LI-11 demonstrated by the reviewed RCTs, recent findings of clinical researches encompassing acupuncture's influence on blood pressure have revealed a number of physiologic rationales: autonomic innervations modified by acupuncture in the light of heart rate variability by the manual stimulation of acupuncture point *Neiguan* P-6;<sup>7</sup> decrease of blood pressure after acupuncture associated with the decrease in rennin secretion;<sup>8</sup> significant vasodilatation of radial artery during acupuncture in sensitized patients;<sup>20</sup> and stimulation at select acupuncture points activating group III and IV afferent pathways to provide input to several cerebral regions concerned with cardiovascular regulation,<sup>21</sup> just name a few. These findings may pave the way for future research in integrative medicine to study the mechanism of acupuncture's effects in lowering blood pressure.

Upon completion of this research project, some limitations are noted. Although most literature reported positive outcomes, a shortage of quality in acupuncture trials still remains. Among others issues, lack of blinding and randomization, comparatively small

sample size for power calculation, low quality of methodology, and unclear outcome measures are the most common. Therefore, only few evidence-based RCTs with detailed descriptions and qualified components were chosen.

## V. CONCLUSION

To a certain extent, the RCTs recruited in this project showed that both real and sham acupuncture in their research subjects decreased systolic or diastolic blood pressure or both, despite the disparities of improvements and statistic significance. Thus, this literature review has demonstrated the evidence of acupuncture's modulating function on blood pressure. Among the select acupuncture points, Quchi *LI-11* might be effective to induce blood pressure reduction. However, more conscientious trials built on various research modes and proved physiological rationales are desired to explicate acupuncture's efficacy in Western medicine terms. Furthermore, encouraging research results demonstrate that acupuncture also lowers blood pressure when used as an adjunctive treatment modality with other therapies such as antihypertensive medication. From this perspective, the clinical utility of acupuncture to treat hypertension and other related cardiovascular diseases deserve additional research.

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**VII. BIO**

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