Effect of press needles on PC6, MA-IC 7, and MA-TF 1 acupuncture points on blood pressure and quality of life in essential hypertension patients

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Abstract. The effect of press needles (PNs) applied to the PC6, MA-IC 7, and MA-TF 1 points is known to reduce blood pressure. This study aimed to determine the effects of press needles applied to the PC6, MA-IC 7, and MA-TF 1 points on blood pressure and Quality of Life Questionnaire scores of essential hypertension patients. We conducted a randomized double-blind clinical trial with controls involving 52 hypertension patients randomly assigned to two groups. The treatment group received PN therapy with antihypertensive drugs, and the control group received placebo PN therapy with antihypertensive drugs. Compared with the control group, the treatment group showed a decrease in systolic blood pressure at 30 minutes and at 3 days (p < 0.05), a decrease in diastolic blood pressure at 30 minutes and at 3 days (p > 0.05), significant improvement in the SF-36 component scores for MH, SF, BP, and GH at 3 days (p < 0.05), and nonsignificant increased component scores of SF-36 PF, RP, RE, and VT at 3 days (p > 0.05). PN therapy with antihypertensive drugs reduced blood pressure and improved quality of life scores in patients with essential hypertension relative to those in the control.

1. Introduction

Essential hypertension (EH) causes 7 million deaths each year, the loss of 64 million years of healthy life (Disability-Adjusted Life Years) and affects up to one billion people worldwide [1]. The prevalence of hypertension in Indonesia is fairly high at 31.7%, but only 0.4% of the patients take antihypertensive drugs [2].

Current antihypertensive medications to achieve the desired blood pressure target should be taken for life, and most are given in the form of combination antihypertensive drugs, but there are problems with drug side effects, such as cough, headache, palpitations, edema of the legs, and low levels of compliance. Several studies have shown that acupuncture can lower blood pressure and improve the quality of life assessed by using the SF-36 questionnaire especially when combined with antihypertensive drug delivery. The World Health Organization lists hypertension as one of the conditions that can be effectively managed with acupuncture on the basis of evidence from controlled clinical trials [3]. Some studies have shown that acupuncture is effective as an adjunctive therapy for the treatment of hypertension [4-6]. A double-blind study assessed blood pressure as one of the parameters of vagal function change in depressed patients treated with press needles (PN). The study
revealed a significant reduction in systolic and diastolic blood pressure in patients in the PN group relative to those in the sham treatment group (placebo). PN needles can stimulate acupuncture points continuously for several days in a safe and noninvasive way [7]. Points PC6, MA-IC 7, and MA-TF1 have been used in some acupuncture studies and shown to decrease blood pressure and regulate vasoactive substance (endothelin) as hypertension therapy [8-10].

This study hypothesized that PN therapy combined with antihypertensive drugs is more effective on lowering blood pressure and improving quality of life according to the SF-36 in EH patients than is placebo PN therapy combined with antihypertensive drugs.

2. Methods
A double-blind randomized clinical trial was conducted with controls (subjects and evaluators were blinded to treatment type). The study protocol was approved by Health Research Ethics Committee, Faculty of Medicine Universitas Indonesia-Cipto Mangunkusumo Hospital. The study was conducted in the Acupuncture Clinic of Cipto Mangunkusumo Hospital, Jakarta from April to June 2016. The study population was EH patients treated at the Acupuncture Polyclinic and Internal Medicine Hypertension Division, Cipto Mangunkusumo Hospital, Jakarta who met the inclusion criteria. The inclusion criteria were age ranging from 18 to 60 years, systolic blood pressure ranging from 140 to 159 mmHg and diastolic blood pressure ranging from 90 to 99 mmHg, received one type of antihypertensive drug, provided signed informed consent, and willingness to follow the study to completion. The exclusion criteria were history of heart failure, stroke, chronic kidney disease, or allergic to bandages; contraindications to acupuncture measures (pregnancy, blood glucose > 200 mg/dl; bleeding disorders and being treated with medication anticoagulants), and contraindication to acupuncture of the ear (because of a skin infection, ear wound, or cauliflower ear). Patients were classified as dropouts if they did not complete the research procedure.

The study sample included 52 subjects who were randomly allocated by using randomization of blocks and randomizing tables. The antihypertensive drugs included were angiotensin-converting enzyme (ACE) inhibitors, diuretics, beta-blockers, calcium channel blockers, and angiotensin II receptor blockers. The PN therapy involved placing PNs at the ear acupuncture points of MA-IC heart, MA-TF 1 Shenmen, and acupuncture body PC6 Neiguan for 3 days. Placebo PN therapy involved bandaging without a PN at the same points as used in PN therapy for 3 days. Blood pressure was measured by using the standard Balithangkes Depkes RI procedure and a calibrated Microlife® digital sphygmomanometer. The Quality of Life Questionnaire used the Indonesian version of Short Form 36 (SF-36) and was conducted by interview before and 3 days after the intervention. The tools and materials used included Seirin Pyonex® PN needles, size 0.20 × 0.60 mm and 0.20 × 1.20 mm, 70% alcohol swabs, timers, gloves, sterile anatomical tweezers, height gauges, body scales, calibrated Microlife® digital sphygmomanometers, and bandages.

The procedure in the PN group was as follows. The patient rested (sitting) first for 15 minutes, a blood pressure examination using a standardized sphygmomanometer was performed along with administration of the SF-36 questionnaire survey before treatment, the patient in a sitting or lying position was asked to wear the supplied eyelets and to free the ear and forearm area, the areas where the acupuncture needles were attached were cleaned aseptically and antiseptically, and bandages were applied over the PNs at the acupuncture points of PC6 Neiguan and MA-IC 7 Heart and MA-TF 1 Shenmen, which were left attached for 3 days. Initially, after attachment of the PNS, the patient was asked to lie down for 30 minutes, and blood pressure was measured at 30 minutes and later at 3 days after the needle insertion. The SF-36 questionnaire survey was reasessed 3 days after the needle attachment before the patient returned after 3 days of needle insertion. The PN was removed after 3 days and disposed in a medical waste bin, and the previously punctured area was cleaned with cotton alcohol. Side effects that occurred due to the acupuncture, such as bleeding, and other assessments and measurements were recorded and documented in the patient’s research data sheet.

The same procedure as used in the PN group was used in the placebo PN group except that only bandaging without PNs were applied.
Statistical analysis was performed by using the SPSS 11.5 software. Data is presented in textual, table, or graphic form.

3. Results
Table 1 shows the characteristics of the study subjects by age, sex, education, type of hypertensive medication, systolic blood pressure, diastolic blood pressure, and initial SF-36 score of both groups. There were no significant differences in any of the characteristics ($p > 0.05$), which indicated that the study subjects could be compared.

| Characteristics                | Treatment Group (n = 26) | Placebo Group (n = 24) | Total | p   |
|-------------------------------|-------------------------|------------------------|-------|-----|
| **Age (year)**                |                         |                        |       |     |
| Median (min–max)              | 51.50 (25–60)           | 44.00 (20–59)          | 50.00 (20–60) | 0.122<sup>a</sup> |
| **Sex**                       |                         |                        |       |     |
| Male, n (%)                   | 6 (23.10)               | 7 (53.80)              | 13 (26.00) | 0.532<sup>b</sup> |
| Female, n (%)                 | 20 (76.90)              | 17 (45.90)             | 37 (74.00) |
| **Education**                 |                         |                        |       |     |
| Primary School, n (%)         | 0 (0.00)                | 0 (0.00)               | 0 (0) | 0.607<sup>b</sup> |
| Middle School, n (%)          | 4 (15.40)               | 2 (83.30)              | 6 (11.54) |
| High School, n (%)            | 12 (46.20)              | 9 (37.50)              | 21 (40.38) |
| Diploma, n (%)                | 6 (23.10)               | 6 (25.00)              | 12 (23.08) |
| Bachelor, n (%)               | 4 (15.40)               | 7 (29.20)              | 11 (22) |
| **Antihypertensive Drugs Type** |                       |                        |       |     |
| ACEI, n (%)                   | 4 (15.40)               | 9 (37.50)              | 13 (26) | 0.056<sup>b</sup> |
| ARB, n (%)                    | 14 (53.80)              | 5 (20.80)              | 19 (38) |
| CCB, n (%)                    | 8 (30.80)               | 10 (41.70)             | 18 (36) |
| Diuretics, n (%)              | 0 (0.00)                | 0 (0.00)               | 0 (0) |
| **Systolic BP (mmHg)**        |                         |                        |       |     |
| Median (min–max)              | 149.00 (130–185)        | 147.50 (140–176)       |       | 0.419<sup>a</sup> |
| **Diastolic BP (mmHg)**       |                         |                        |       |     |
| Median (min–max)              | 90.00 (80.00–124.00)    | 90.50 (60–117)         |       | 0.938<sup>a</sup> |
| **Initial SF-36 PF Score**    |                         |                        |       |     |
| Median (min–max)              | 90.00 (60–100)          | 90.00 (45–100)         |       | 0.685<sup>a</sup> |
| **Initial SF-36 RP Score**    |                         |                        |       |     |
| Median (min–max)              | 75.00 (0–100)           | 75.00 (0–100)          |       | 0.396<sup>a</sup> |
| **Initial SF-36 RE Score**    |                         |                        |       |     |
| Median (min–max)              | 83.34 (33.33–100)       | 100 (66.67–100)        |       | 0.596<sup>a</sup> |
| **Initial SF-36 VT Score**    |                         |                        |       |     |
| Median (min–max)              | 80 (40–95)              | 80 (70–95)             |       | 0.579<sup>a</sup> |
| **Initial SF-36 MH Score**    | Mean (SD)               |                        |       |     |
| 86 (9.07)                     | 88.33 (8.58)            |                       |       | 0.356<sup>c</sup> |
| **Initial SF-36 SF Score**    |                         |                        |       |     |
| Median (min–max)              | 75 (50–100)             | 81.25 (50–100)         |       | 0.130<sup>a</sup> |
| **Initial SF-36 BP Score**    |                         |                        |       |     |
| Median (min–max)              | 77.50 (52.50–100)       | 90 (35–100)            |       | 0.388<sup>a</sup> |
| **Initial SF-36 GH Score**    |                         |                        |       |     |
| Median (min–max)              | 70.83 (12.50–87.50)     | 75.00 (4.17–87.50)     |       | 0.084<sup>a</sup> |

Notes: ACEI, angiotensin-converting enzyme inhibitor; ARB, angiotensin II receptor blocker; CCB, calcium channel blocker; BP, blood pressure; SF-36, Short Form 36; PF, physical functioning; RP, role physical; RE, role emotional; VT, vitality; MH, mental health; SF, social functioning; BP, bodily pain; GH, general health.

<sup>a</sup> Mann–Whitney Test, <sup>b</sup> Chi-square test, <sup>c</sup> Unpaired t-test
Table 2 shows that after a 30-minute intervention, the mean difference in decreased systolic BP was 9.67 and was greater in the treatment group than in the placebo group ($p < 0.05$; 95% CI: $-13.92$ to $-5.41$).

**Table 2. Differences in Change in Systolic Blood Pressure Between the Treatment Group and Placebo Group After 30 Minutes**

| Variables          | Mean (SD)      | Mean Difference (CI 95%)     | p    |
|--------------------|----------------|-------------------------------|------|
| ΔSystolic BP       |                |                               |      |
| Treatment          | $-9.46 (8.18)$ | $-9.67 (-13.92$ to $-5.41)$   | <0.001* |
| Placebo            | $0.21 (6.63)$  |                               |      |

Notes: Δ, change; *Unpaired t-test

Table 3 shows that after 30-minute intervention, the mean difference in decreased diastolic BP was 3.09 and was greater in the treatment group than in the placebo group. However, the mean difference was not statistically significant ($p > 0.05$; 95% CI: $-6.58$ to $-0.40$).

**Table 3. Differences in Change in Diastolic Blood Pressure Between the Treatment Group and Placebo Group After 30 Minutes**

| Variable           | Mean (SD)      | Mean Difference (CI 95%)     | p    |
|--------------------|----------------|-------------------------------|------|
| ΔDiastolic BP      |                |                               |      |
| Treatment          | $-4.92 (4.95)$ | $-3.09 (-6.58$ to $-0.40)$    | 0.082 |
| Placebo            | $-1.54 (7.00)$ |                               |      |

Notes: Δ, change; *Unpaired t-test

It can be seen in Table 4 that after 3 days of intervention, the mean difference in decreased systolic BP was 11.67, which was greater in the treatment group than in the placebo group ($p < 0.05$; 95% CI: $-16.11$ to $-7.23$).

**Table 4. Differences in Changes in Systolic Blood Pressure Between the Treatment Group and Placebo Group After 3 Days**

| Variables          | Mean (SD)      | Mean Differences (CI 95%)     | p    |
|--------------------|----------------|-------------------------------|------|
| Δsystolic BP       |                |                               |      |
| Treatment          | $-14.00 (9.52)$| $-11.67 (-16.11$ to $-7.23)$  | <0.001 |
| Placebo            | $-2.33 (5.69)$ |                               |      |

Notes: Δ, changes; *Unpaired t-test

Table 5 shows that after 3 days of intervention, the mean difference in decreased diastolic BP was 1.65 and was greater in the treatment group than in the placebo group. However, the mean difference was not statistically significant ($p > 0.05$; 95% CI: $-5.94$ to $-2.64$).

**Table 5. Differences Change in Diastolic Blood Pressure of Treatment Group and Placebo Group after 3 Days**

| Variables          | Mean (SD)      | Mean Differences (CI 95%)     | p    |
|--------------------|----------------|-------------------------------|------|
| ΔDiastolic BP      |                |                               |      |
| Treatment          | $-5.15 (6.21)$ | $-1.65 (-5.94$ to $-2.64)$    | 0.443 |
| Placebo            | $-3.50 (8.77)$ |                               |      |

Notes: Δ changes, *Unpaired t-test
Table 6 shows that after intervention, the scores for the MH, SF, BP, and GH components significantly increased among the eight components of the SF-36 in the treatment group relative to those in the placebo group, with mean differences of 2.86, 6.53, 7.75, and 5.99 (p < 0.05). In the PF, RP, RE, and VT score components, there were increases in the mean scores in the treatment group relative to those in the placebo group, with mean differences of 1.87, 9.46, 9.84, and 2.73 (p > 0.05). The side effects found during the study were itching and redness at the PN and placebo attachment sites in 1/26 (3.85%).

Table 6. Differences in Changes in the SF-36 Scores Between the Treatment and Control Groups After Intervention

| Variables          | Mean Changes (SD) | Median (min-max) | p     |
|--------------------|-------------------|------------------|-------|
| Δ SF-36 PF Score   |                   |                  |       |
| Treatment          | 5.00 (5.48)       | 5.00 (0.00 to 20.00) | 0.357*|
| Placebo            | 3.13 (6.39)       | 5.00 (~5.00 to 20.00) |       |
| Δ SF-36 RP Score   |                   |                  |       |
| Treatment          | 11.54 (16.17)     | 0.00 (0.00 to 50.00) | 0.075*|
| Placebo            | 2.08 (16.35)      | 0.00 (~25.00 to 25.00) |       |
| Δ SF-36 RE Score   |                   |                  |       |
| Treatment          | 14.10 (21.44)     | 0.00 (0.00 to 66.67) | 0.159*|
| Placebo            | 4.17 (20.41)      | 0.00 (~33.33 to 33.33) |       |
| Δ SF-36 VT Score   |                   |                  |       |
| Treatment          | 4.81 (9.43)       | 5.00 (~15.00 to 30.00) | 0.063*|
| Placebo            | 2.08 (5.50)       | 0.00 (~5.00 to 20.00) |       |
| Δ SF-36 MH Score   |                   |                  |       |
| Treatment          | 3.69 (5.87)       | 4.00 (~12.00 to 16.00) | 0.023*|
| Placebo            | 0.83 (2.88)       | 0.00 (~8.00 to 4.00) |       |
| Δ SF-36 SF Score   |                   |                  |       |
| Treatment          | 9.13 (9.71)       | 12.50 (0.00 to 37.50) | 0.044*|
| Placebo            | 2.60 (11.64)      | 0.00 (~25.00 to 25.00) |       |
| Δ SF-36 BP Score   |                   |                  |       |
| Treatment          | 10.67 (13.35)     | 12.50 (~22.50 to 27.50) | 0.011*|
| Placebo            | 2.92 (11.58)      | 0.00 (~22.50 to 32.50) |       |
| Δ SF-36 GH Score   |                   |                  |       |
| Treatment          | 9.29 (9.38)       | 8.33 (~20.83 to 29.17) | <0.001*|
| Placebo            | 3.30 (4.76)       | 0.00 (~0.00 to 16.67) |       |

Notes: Δ, changes; *Mann–Whitney Test
and 2/26 (5.77%) subjects, respectively, as well as stiffness of the PN puncture 1/26 (3.85%). Other side effects, such as infection, were not found during the study.

4. Discussion
The effects of PN combined with antihypertensive drugs were studied in 52 EH patients by assessing changes in blood pressure and Quality of Life Questionnaire scores (SF-36) of the subjects. All subjects were randomly assigned to two groups: the treatment group, which received PN treatment with antihypertensive drugs, and the placebo group, which received placebo PN treatment with antihypertensive drugs. There were no significant differences in the subject characteristics between the treatment and placebo groups, and the subjects were randomly assigned. To maintain compliance with the study protocol, the subjects were given a telephone number to contact a researcher if the patient had a question or complaint. A day before the scheduled PN or PN placebo action, a researcher contacted the subjects to remind them of their appointments. The subject participation took only 3 days. Two subjects from the placebo group dropped out of the study because they had itching at the plaster attachment site and had removed the plaster without PN before 3 days.
In the treatment group, PNs with a size of $0.6 \times 0.2$ mm were applied at points MA-IC 7 and MA-TF 1, and PNs of size $1.2 \times 0.2$ mm were applied at point PC6 and then covered with a bandage, whereas in the placebo group, only bandaging was applied at the same points as those in the treatment group. The selection of these acupuncture points was the same as that used in the study by Rodiah et al. (ear points MA-IC Heart, MA-T Adrenal Gland, and MA-TF Shenmen) and Yutamulia (PC6 Neiguan point and Heart ear point) [9,10]. For the placebo group, only bandaging was applied to avoid bias because recent studies have shown that the usual control/placebo procedures used in acupuncture studies, such as superficial needling, sham acupuncture, and placebo acupuncture, still provide a therapeutic effect (stimulating afferent nerve fiber C that stimulates the insular region in the brain), which explains why control/placebo intervention is as effective as acupuncture therapy [11,12]. PN is a modality that has the advantages of an easy and short installation process, stimulates acupuncture points continuously for 3 days, and is noninvasive and safe [7]. This study was the first in Indonesia to apply PN in EH patients followed by measurement of blood pressure and SF-36 scores as the outcomes.

Assessment of blood pressure was performed at baseline, 30 minutes, and 3 days after treatment, and SF-36 scores were obtained at baseline and 3 days after treatment. The changes in blood pressure values at 30 minutes and at 3 days from baseline values after each treatment were compared between the two groups and analyzed statistically. Differences in SF-36 scores (between baseline and 3 days after treatment) were also compared between the two groups and analyzed statistically. There were no differences in the subject characteristics between the two groups, including age, sex, education, body mass index, duration of EH drug consumption, systolic blood pressure, diastolic blood pressure, and SF-36 score, which indicated that the subjects could be compared with minimal bias.

The measurement of blood pressure after 30 minutes was in accord with a study by Rodiah et al. that used ear acupuncture and blood pressure as its parameters [9]. The measurement of blood pressure after 3 days was in accord with a study by Noda et al. that also used PN as a modality and blood pressure as a treatment parameter [7]. The results of this study showed that after 30 minutes and 3 days, the mean differences in decreased systolic blood pressure in the treatment and placebo groups were 9.67 and 11.67 mmHg, respectively, which were significantly different ($p < 0.05$). After 30 minutes and 3 days, the mean differences in decreased diastolic blood pressure in the treatment and placebo groups were 3.09 and 1.65 mmHg, respectively, but the difference was not significant ($p > 0.05$). PN might be a good EH treatment modality because of its minimal side effects, especially when compared with other hypertensive managements, such as aerobic exercise, that can decrease systolic blood pressure and diastolic blood pressure by 3.8 and 2.6 mmHg, respectively, diet control can decrease systolic blood pressure and diastolic blood pressure by 4–4.3 and 1.9 mmHg, respectively, and a single 1–12 hour pharmacological therapy (ACE-inhibitor) that can decrease systolic blood pressure and diastolic blood pressure by 11 and 6 mmHg, respectively [13-15].

The mechanism of action of acupuncture on PC5 and PC6 according to Li et al. begins with delivery of an excitatory stimulus through the median nerve [fibers Aδ (63%) and C (37%)] to the spinal cord via the dorsal root ganglia. Then, the stimulus is forwarded to the medulla lateral ventral spine (rVLM), ventrolateral periaqueductal gray (vlPAG), and the arcuatus nucleus. In the rVLM and vlPAG, it is known that low-intensity and low-frequency electroacupuncture stimulates c-Fos expression, so rVLM (due to μ and δ receptor activations) and vlPAG produce endorphins, enkephalin, and GABA that inhibit increased blood pressure through sympathetic premotor nerve inhibition [16,17].

Ear acupuncture (MA-IC 7 point) predominantly stimulates ABVN to be transmitted to the nucleus tractus solitarius. Furthermore, caudal ventrolateral medulla activation occurs through a glutamatergic mechanism, which then inhibits rVLM through GABA release and ultimately decreases the activity of sympathetic nerve fibers [18]. Another use of ear acupuncture (MA-TF 1 point and other ear acupuncture points) is in the treatment of anxiety in preoperative, dental, and depression cases. Several studies have linked the effects of this therapy to the production of serotonin by the
pituitary. The effect of relieving stress or calming the mind is directly proportional to the decrease in blood pressure and heart rate of EH patients [16,17].

PN, according to Kawakita and Okada, is one of the acupuncture modalities often used in Japan [19]. According to Zhou et al., manual acupuncture can affect the autonomic nerve by inhibiting sympathetic nerve fibers and increase parasympathetic activity that greatly affect blood pressure [20]. Acupuncture affects the cardiovascular system through the autonomic nervous system. Research has shown that afferent input in somatic nerve fibers has a significant effect on pain as well as autonomic and hormonal functions. The effects of acupuncture modulation on the sympathetic and cardiovascular systems are associated with somato-autonomic reflexes. Neural regulation of the circulatory function is primarily achieved by the sympathetic and vagal nerves and physiological conditions of activation followed by other inhibitions. The sympathovagal balance is modulated by the interaction of three major factors: central nervous interactions, peripheral reflex inference mechanisms, and peripheral excitatory reflex mechanisms. This interaction occupies both the spinal and supraspinal levels with afferent inputs activating the preganglion in the same or adjacent segment resulting in somatosympathetic and/or somatoparasymthetic reflexes [21].

Lee and Kim stated that the hemodynamic suppressive effect of acupuncture might be associated with decreased activity of plasma renin. Thus, the reduced activity of plasma renin has implications for the decline in SRAA as well [22]. Acupuncture is also known to inhibit T-type calcium channel protein smooth respiratory muscle [23]. Theoretically, the effect of inhibiting the entry of calcium into the heart muscle cells or smooth muscle of the blood vessels will cause relaxation of the smooth muscle, which reduces the peripheral resistance; however, more research on this subject is required.

To evaluate the therapeutic effect on the quality of life of EH patients, we used the SF-36 questionnaire. SF-36 is a general quality of life assessment instrument used in almost all chronic disease research, including EH. Chen et al. [6] also used the SF-36 questionnaire in a study assessing the effect of acupuncture treatment on hypertension with a 3-day interval, similar to that of Yeh et al. [6,24]. The SF-36 has been translated into the languages used in 50 countries, is used for >200 conditions/diseases, and until 2012 has been documented in 18,717 publications. SF-36 consists of 36 questions consisting of eight components: PF, RP, MH, RE, SF, VT, blood pressure, and GH [6,24]. In the present study, there were improvements in quality of life both in the treatment group and placebo group. According to a meta-analysis, a large number of antihypertensive drugs are known to improve quality of life (sleep quality, psychomotor, general health, and mood) [19].

Four components of the SF-36, MH, SF, blood pressure, and GH, showed significant increases in scores (p < 0.05) in the treatment group relative to those in the placebo group. In the other four SF-36 components, there were increases in scores, but the differences between the treatment and placebo groups were not significant. These results were similar to those of a previous study [24] in which the significance of the SF-36 score was only found on the MH and blood pressure components [24]. This study also supports previous studies in which 10 weeks of acupressure treatment of the ear decreased pain in hypertensive patients, which is consistent with studies also on decreasing pain scores in patients with chronic neck pain and spinal postoperative pain [25,26]. The potential mechanism of pain reduction from ear acupuncture involves various kinds of neurotransmitters, such as serotonin, norepinephrine, and GABA that are known to inhibit signals delivered to the central nervous system [18]. To assess this result, the researcher recommended that the quality of life score should be determined after a longer time interval following treatment in a larger sample to obtain more reliable results.

The present study results on PN for hypertension are also expected to be useful for various conditions and complications, such as pregnancy (pre-eclampsia), geriatrics, and side effects of antihypertensive drugs. Acupuncture in pregnancy is relatively safe if performed by skilled and professional personnel [27]. Acupuncture is known to help lower blood pressure in cases of pre-eclampsia in labor and postpartum [28]. In elderly patients with hypertension, acupuncture combined with antihypertensive medications was more effective in lowering blood pressure than were antihypertensive drugs alone [29]. Acupuncture also overcomes antihypertensive drug side effects,
such as diarrhea and fatigue, experienced by some patients so that medication adherence of antihypertensive drugs can be maintained [30].

A limitation of this study was that the research time was too short to allow clinical monitoring of how long the effect of PN persisted in the research subjects after PN therapy. Since EH is a chronic disease, it is necessary to observe long-term effects (6 months to 1 year) to fully assess the clinical benefits of PN.

5. Conclusion
PN at the acupuncture points of PC6, MA-IC 7, and MA-TF1 used with antihypertensive drugs was more effective in decreasing blood pressure, especially systolic blood pressure, than was placebo PN with antihypertensive drugs in EH patients.

References
[1] Kearney P M, Whelton M, Reynolds K, Muntner P, Whelton P K and He J 2005 Global burden of hypertension: analysis of worldwide data Lancet 365 217
[2] RISKESDAS 2007 Riset Kesehatan Dasar (Riskesdas). [Jakarta: Litbang Depkes RI]
[3] World Health Organization 2002 Diseases and Disorders That Can Be Treated with Acupuncture (Geneva, Switzerland: World Health Organization)
[4] Zhao X F, Hu H T, Li J S, Shang H C, Zheng H Z, Niu J F, Shi X M and Wang S 2015 Is Acupuncture Effective for Hypertension? A Systematic Review and Meta-Analysis PLOS ONE 10 1
[5] Wang J, Xiong XJ and Liu W 2013 Acupuncture for essential hypertension Int. J. Cardiol. 169 317
[6] Chen H, Dai J, Zhang X, Wang K, Huang S, Cao Q, Wang H, Liang Y, Shi C, Li M and Ha T 2013 hypothalamus-Related Resting Brain Network Underlying Short-Term Acupuncture Treatment in Primary Hypertension Altern. Med. 2013 1
[7] Noda Y, Izuno T, Tsuchiya Y, Hayasaka S, Matsumoto K, Murakami H, Ito A, Shinse Y, Suzuki A and Nakamura M 2015 Acupuncture-induced changes of vagal function in patients with depression: A preliminary sham-controlled study with press needles Complement. Ther. Clin. Practice 21 193.
[8] Guan YH and Wu XP 2005 The influence of electroacupuncture Neiguan on the content of ET, TXB2 and 6-Keto-PGF1α in acute myocardial ischemia rabbits Hu Bei Zhong Yi Xue Yuan Xue Bao 7 13
[9] Rodiah N, Pramono C and Srilestari A 2012 Perbandingan Efek Akupunktur Telinga Dengan Akupunktur Tubuh Terhadap Tekanan Darah Dan Kadar Nitrit Oksida Pada Pasien Hipertensi Esensial Di Puskesmas Kecamatan Jatinegara Universitas Indonesia, Jakarta. Spesialis Tesis
[10] Yutamulia FZ and Srilestari A 1998 Pengaruh penusukan titik Neikuan dan titik Jantung pada telinga terhadap hipertensi sedang di Puskesmas Ciburayut Kab. DT II Bogor, Universitas Indonesia, Jakarta,. Spesialis Tesis
[11] Lund I and Lundeberg T 2006 Are minimal, superficial or sham acupuncture procedures acceptable as inert placebo controls? Acupunct Med 24 13
[12] Olausson H et al. 2002 Unmyelinated tactile afferents signal touch and project to insular cortex Nat. Neurosci. 5 900
[13] Chiu Y J, Chi A and Reid I A 1997 Cardiovascular and endocrine effects of acupuncture in hypertensive patients Clin. Exp. Hypertens. 19 1047
[14] Li P, Stephanie C, Looi T A and Longhurst J C 2013 Current Research in Acupuncture, (ed) Xia Y et al. (New York: Springer Science Business Media) (pp 457-486)
[15] Lip G Y H and Beevers D G 2007 *ABC of Hypertension*. 5th ed, (ed) Lip G et al. (Oxford: BMJ Publishing Blackwell) pp 1-6
[16] Kang X and Xia Y 2009 *Acupuncture Therapy for Neurological Diseases*, (ed) Xia Y et al. (Oxford: Springer) (pp 289-312)
[17] Wang S M and Kain Z N 2001 Auricular acupuncture: a potential treatment for anxiety *Anesth. Analg.* 92 548
[18] He W, Wang X, Shi H, Shang H, Li L, Jing X and Zhu B 2012 *Evid.Based Complement. Alternat. Med.* 2012 786839
[19] Kawakita K and Okada K 2014 Acupuncture therapy: mechanism of action, efficacy, and safety: a potential intervention for psychogenic disorders? *Biopsychosoc. Med.* 8 4
[20] Zhou W, Fu L W, Tjen-A-Looi S C, Li P and Longhurst J C 2005 Afferent mechanisms underlying stimulation modality-related modulation of acupuncture-related cardiovascular responses *J. Appl. Physiol.* 98 872
[21] Haker E, Egekvist H and Bjerring P 2000 Effect of sensory stimulation (acupuncture) on sympathetic and parasympathetic activities in healthy subjects *J. Auton. Nerv. Syst.* 79 52
[22] Lee H S and Kim J Y 1994 Effects of acupuncture on blood pressure and plasma renin activity in two-kidney one clip Goldblatt hypertensive rats *Am. J. Chin. Med.* 22 215
[23] Wang Y, Sun J, Jin R, Liang Y, Liu Y Y, Yin L M and Xu Y D 2012 Influence of acupuncture on expression of T-type calcium channel protein in airway smooth muscle cell in airway remodeling rats with asthma *Zhongguo Zhen Jiu* 32 534
[24] Yeh M L, Chang Y C, Huang Y Y and Lee T Y 2015 A randomized controlled trial of auricularacupressure in heart rate variability and quality of life for hypertension *Complement. Ther. Med.* 23 200
[25] Matsubara T, Arai Y C and Shiro Y, et al. 2011 Comparative effectsof acupressure at local and distal acupuncture points on pain conditions and autonomic function in females withchronic neck pain *Evid.Based Complement. Alternat. Med.* 2011 1
[26] Yeh M L, Tsou M Y, Lee B Y, Chen H H and Chung Y C 2010 Effects of auricularacupressure on pain reduction in patient-controlled analgesia after lumbar spine surgery *Acta Anaesthesiol. Taiwan*. 48 80
[27] Park J, Sohn Y, White A R and Lee H 2014 he safety of acupuncture during pregnancy: a systematic review*Acupunct. Med.* 32 257
[28] Zeng Y, Liu B, Luo T, Chen Y, Chen G and Chen D 2016 Effects of acupuncture on preeclampsia in Chinese women: a pilot prospective cohort study *Acupunct. Med.* 34 144
[29] Holovakha L M 1998 Cryopuncture in the treatment of stage-II essential hypertension in middle-aged and elderly subjects *Lik Sprava* 7 144
[30] Zhang L, Shen P and Wang S 2014 Cupuncture treatment for hypertension: a case study *Acupunct. Med.* 32 73.