The Effects of Auricular Acupressure on Physiological Index, Depression, Anxiety, and Stress for Elders With Hypertension

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The purpose of the study was to examine the effects of auricular acupressure (AA) on physiological index, depression, anxiety, and stress in elderly people with hypertension. The verum group received verum AA therapy for 8 weeks. Five different acupressure sites were applied in each group. There was a significant difference in systolic blood pressure between the 2 groups after 8 weeks of AA, whereas a significant difference in pulse pressure was found between the 2 groups after 6 weeks of AA. This study is meaningful in comparing intervention and sham groups, verifying the effects by using physiological and psychological variables, and confirming the effects of repetitive measurement. AA therapy is expected to be a practical and efficient health care intervention for elderly people with hypertension. **KEY WORDS:** *acupressure*, *anxiety*, *depression*, *hypertension*, *stress*

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INTRODUCTION

In modern society, the number of people with chronic diseases is increasing due to rapid economic growth, increased income, changes in lifestyle, and an aging population. According to the Sixth National Health and Nutrition Examination Survey, the highest prevalence of hypertension has been recorded for chronic diseases in Korea since 1998, which was when survey results were first examined. Also, the prevalence of hypertension in people 65 years and older was 64.7%, showing that more than 6 of every 10 elderly Koreans suffer from hypertension.[1] The increase in life expectancy, increase in the size of the elderly population, and high prevalence of hypertension in the elderly are social burdens that extend beyond the individuals.[2]

Hypertension occurs in adults with a systolic blood pressure greater than 140 mm Hg or a diastolic blood pressure greater than 90 mm Hg,[3] divided into essential hypertension (primary), with an unclear cause, and secondary hypertension, when blood pressure increases due to other diseases. As people age, the endangium thickens and elasticity of the arteries decreases, causing challenges in blood pressure control as well as a change in physiological indicators, such as blood pressure, pulse pressure, and heart rate. Systolic blood pressure increases further, whereas diastolic blood pressure decreases after middle age; pulse pressure indicates that the difference between systolic and diastolic blood pressure also increases.[4] Thus, hypertension in elderly people aligns with a significant increase in systolic and pulse pressure, which are major risk factors for cardiovascular disease.[5] Essential hypertension, which accounts for more than 95% of elderly hypertension, is often asymptomatic, so it is difficult to detect early.[6] Therefore, if it is not properly managed and cared for, it can easily lead to cardiovascular diseases such as stroke, angina, and myocardial infarction, as well as secondary complications like kidney disease, and ultimately increase the mortality rate.[3] For these reasons, it is necessary to continuously manage and

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control the blood pressure of the elderly. In addition, chronic diseases such as hypertension can lead to negative emotions, such as depression, anxiety, and stress, when the physical function of the elderly deteriorates. Because stress applied to the body causes sympathetic nerves to activate and cardiac output to increase,[7,8] it is necessary to pay attention to the social psychological problems of elderly people.

The World Health Organization[9] suggested the use of nonpharmacotherapy, such as exercise, diet, relaxation, and alternative therapies, for treatment and management of blood pressure. Pharmacotherapy should be applied first to effectively improve blood pressure, but due to its side effects, interest is growing in nonpharmacotherapy solutions. Changes in lifestyle, such as regular exercise, weight loss, and low-salt diet, are difficult to implement and sustain[10] because they require continuous and long-term effort. Thus, a need persists for interventions that have fewer side effects and are easily applicable in clinical settings.

Auricular acupressure (AA), which is a complementary and alternative therapy, is a method to help in the recovery from diseases by diagnosing health conditions of the human body and stimulating points of ear reflexology. AA is based on the traditional concept of Qi, or energy flowing around the body channels called meridians. The meridians are found in various parts of the body, called microsystems, and reflected throughout the body. Since the concept of meridians assumes that the entire body is compressed in the feet, hands, and ears, these body parts are considered to be the second human body.[11] AA is easier and more convenient than other therapies. Compared to other therapies, materials and devices needed for treatment are simple and convenient, so it can be easily performed anywhere. Because it is a noninvasive and noninflammatory intervention that can be easily applied in clinical practice, it can be used in elderly people without concerns about pain and other side effects.[12]

Studies on AA have proven effective in people with obesity,[13] constipation,[14] and smoking cessation[15]; however, few studies have examined the effect of AA on patients with chronic hypertension. A study that applied AA in adults with hypertension showed no effect on blood pressure and pulse reduction,[16] but mental health and body pain improved in quality-of-life items. In addition, a study that applied abdominal acupuncture and AA[17] showed that the combination of the 2 therapies was effective in reducing blood pressure. A study conducted in Korea by Jun[18] reported that AA is effective in reducing blood pressure and pulse pressure among elderly women with essential hypertension.

According to previous studies,[16-18] AA is expected to improve the physiological index of patients with hypertension; however, few studies have been conducted in Korea. In addition, previous studies[16-18] were quasiexperimental in design and recruited participants from a single organization without randomization. Since these studies did not have a control group or did not provide treatment to the control group, the Hawthorne effect cannot be ruled out. Also, there is a limit to the generalizability of the results, as the researchers measured the dependent variable before and after the intervention. In one study,[16] AA was not effective in reducing blood pressure, but in another study,[17] the combined application of AA and abdominal acupuncture resulted in blood pressure reduction. It was not clear whether the reduced blood pressure was an effect of the AA. Another study found that AA was effective in reducing blood pressure.[18] Likewise, there are a variety of results reported in terms of the effects of AA in blood pressure reduction.

Therefore, this study aimed to examine the effects of AA with a randomly assigned group of elderly people with essential hypertension and compare a sham (control) group that received AA at the points of ear reflexology unassociated with hypertension. In addition, the effects of AA were repeatedly evaluated to examine its efficacy, and finally, a scientific basis for presenting AA as a nonpharmacological treatment for essential hypertension is suggested.

METHODS

Design

This study was an experimental study using a randomized, single-blind, placebo-controlled study to examine the effects of AA on physiological indicators, depression, anxiety, and stress in elderly people with essential hypertension. The AA used vaccaria seeds taped onto one ear.

Hypothesis

Hypothesis 1: The verum (experimental) group to which AA was applied would improve physiological

indicators over time compared with the sham (control) group.

Hypothesis 2: The verum (experimental) group to which AA was applied would alleviate depression, anxiety, and stress after intervention compared with the sham (control) group.

Sample participants

This study was conducted from September 1 to November 10, 2017. Elderly people who were 65 years or older, diagnosed with essential hypertension, and visited 4 elderly people's welfare facilities in Seoul and H City in Gyeonggi-do were selected as participants. For randomization of the verum (experimental) and sham (control) groups, an Excel program was used.

The criteria for the selection of participants were patients (*a*) who were 65 years or older; (*b*) diagnosed with essential hypertension; (*c*) taking antihypertensive agents; and (*d*) had not experienced AA. The criteria for the exclusion of participants were (*a*) those who were receiving other complementary and alternative therapies for blood pressure control and (*b*) those with problems of ear skin integrity.

The sample size for this study was calculated using G*power 3.1.9.2. The significance level (α) was .05, power was 0.8, and effect size was 0.75, based on a previous study.[16] Consequently, the output showed that at least 23 subjects were needed in each group. Considering the dropout rate, the researcher recruited a total of 60 participants from 4 elderly people's welfare facilities and enrolled 50 participants, excluding 6 who did not meet criteria and 4 who withdrew consent. We randomly assigned participants from each facility to the verum (experimental) and sham (control) groups using an Excel program. Data were accrued from 25 people in the verum (experimental) groups from 2 elderly people's welfare facilities and 25 people from the sham (control) groups from 2 other elderly people's welfare facilities. A person in the verum (experimental) group withdrew from the study, as participants removed the seed patches, which bothered this person. Three people in the sham (control) group withdrew due to personal circumstances. Therefore, a total of 46 people participated in the study: 24 in the verum (experimental) group and 22 in the sham (control) group (see Figure 1).

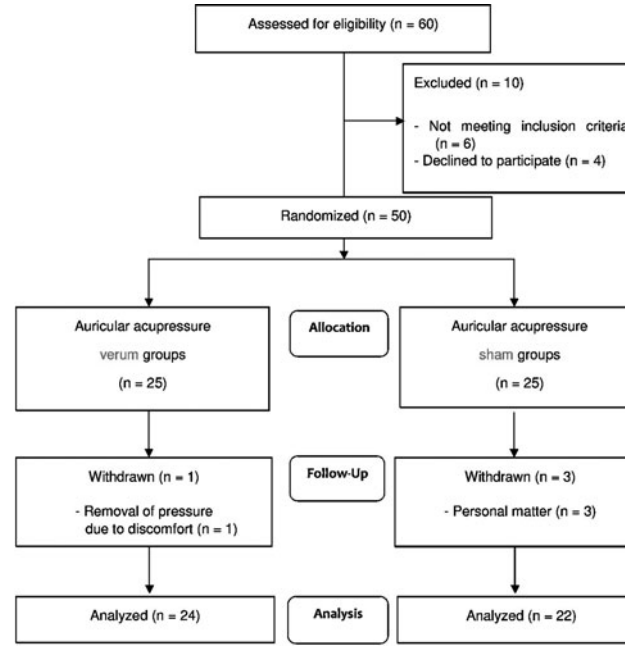

FIGURE 1. CONSORT flow diagram of the study.

Outcome measures

Physiological indicators (systolic blood pressure, diastolic blood pressure, pulse pressure, and heart rate)

Blood pressure was measured on the left upper arm in a sitting position after having the patient rest for a minimum of 5 minutes. By using an electronic blood pressure monitor (CBP-100A Digital Automatic Electronic Blood Pressure Monitor, COZYMA, made in China), the researcher measured systolic and diastolic blood pressure and heart rate twice at intervals of 5 minutes and calculated the average value. Pulse pressure is the result of calculating the difference between systolic blood pressure and diastolic blood pressure.

Depression, anxiety, and stress

Depression, anxiety, and stress were measured using the Korean version of the Depression Anxiety Stress Scale (K-DASS-21), which has proven to be reliable and valid in Korea. The K-DASS-21 was translated from the DASS-21, a tool of depression, anxiety, and stress developed by Henry and Crawford,[19] into Korean by Lee et al.[20] With 3 subdomains on depression, anxiety, and stress, the tool has a total of 21 items, composed of 7 items in each domain. We downloaded the K-DASS-21 from the DASS homepage. The scale consists of 4 points, with

scores ranging from 0 to 63 points; the higher the score is, the greater the degree of depression, anxiety, and stress is. The Cronbach α, the reliability of the DASS-21 at the time of its development, was 0.88 for depression, 0.82 for anxiety, and 0.90 for stress.[19] The Cronbach α of the K-DASS-21 was 0.91, 0.85, and 0.90 for depression, anxiety, and stress, respectively.[20] In 1 study construct validity was secured through the convergent or discriminant validity of the DASS-21.[19] In this study, the Cronbach α was 0.80 for depression, 0.69 for anxiety, and 0.76 for stress.

Rationale for AA selection

AA points were selected based on a domestic and overseas literature review on AA[16-18,21,22] and consultations with an AA expert. Shenmen, which is one of the most basic ear reflexology points, is the area governed by the vagus nerve. When this area is stimulated, the sympathetic nerve becomes suppressed and the parasympathetic nerve is activated, resulting in the cerebral cortex's regulating excitation-inhibition. Also, it helps reduce blood pressure and improve pain by alleviating anxiety and tension.[16] The auricular point corresponding to the heart is the site that controls the blood, blood vessels, and blood pressure and is selected when there is heart disease or hypertension.[18] The auricular point for the kidneys is known to regulate blood pressure by controlling weak energy and congested body fluid, according to oriental medicine.[22] The point at the occiput is the passage where blood circulation and the cranial nerve intersect. High blood pressure causes stiffness in the occiput and headache; therefore, stimulating the back of the head and the blood vessels of the vertebral artery that lead to the brain improves the blood flow of cerebral blood vessels and lowers blood pressure.[19]

Intervention

The author of this study completed the curriculum for AA specialists from the Korea-China Self-Healing Power Association and acquired certification. Data were collected from September to October 2017.

AA is one of the complementary and alternative therapies widely used in traditional Chinese medicine, and it is a natural healing health method that strengthens immunity and improves the quality of life when stimulation is applied to ear reflexology points. AA was developed based on ancient Chinese ear acupuncture, and in the 1950s, French doctor Paul Nogier proved that specific areas of the ear and 5 organs of the body are pathologically related. Since it is easy to apply, safe and convenient, AA is widely applied in clinical practice, and is a safe complementary and alternative therapy with few side effects. Vaccaria seeds used in AA are large and hard, so the meridian effect is excellent.[10-12,23]

In the verum (experimental) group, verum (experimental) AA was applied to 5 reflexology points related to hypertension of 1 ear for 8 weeks, while sham (control) AA was applied to ear reflexology points that were not related to hypertension for the sham (control) group using the same method that was applied to the verum (experimental) group.

The process of AA is discussed below:

1. Before AA, the researcher wiped off foreign materials from one ear with cotton pads sterilized with saline solution.
2. The acupressure adhesive patches available on the market were made by pasting vaccaria seeds to adhesive plasters, 7 mm in diameter, and applied to participants.
3. Based on previous research, an expert Eastern doctor reviewed the 5 ear acupressure points—Shenmen (HE-7), hypertension point, heart, kidney, and occiput—for their appropriateness and accuracy for hypertension; then, the patches were applied to the verum (experimental) group (see Figure 2).
4. The researcher applied the acupressure patches directly to participants and pressed the points 5 times, strong enough that participants could feel pain, at intervals of 2 seconds. This helped participants feel the intensity of the pressure so they could perform the pressing action afterward.
5. In accordance with a previous study, the patches remained on 1 ear for 5 days, followed by a period of rest for 2 days.[16]
6. After participants manually removed the patches, the researcher asked participants to gently massage the ear. On the sixth day, the researcher sent participants a text message indicating they should remove the patches and notified them of the schedule for the next visit. This process continued a total of 8 times, once a week for 8 weeks.
7. For the sham (control) group, the researcher selected the 5 ear acupressure points for the knees, chest, teeth, jaw, and anus and applied AA in the same manner during the same period as the verum (experimental) group. Aside from the ear

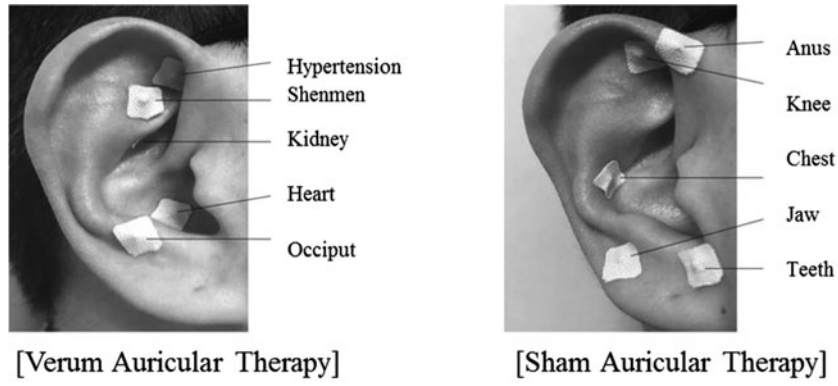

FIGURE 2. The 5 acupoints for auricular acupressure.

acupressure points, the method of AA, as well as the time, frequency, and intensity of pressure, was consistent across groups. In consideration of ethical issues, the researcher applied AA for hypertension to the sham (control) group after completing the study.

To prevent the intervention of exogenous variables, the researcher instructed participants from the verum (experimental) and sham (control) groups not to receive any other treatment except AA and asked them to inform the researcher if they did use other treatments, so the researcher could withdraw their participation from the study. The researcher informed participants of the method and procedures of the study details in advance and sent a text message 2 days ahead of the schedule to encourage participants to visit the clinic every week for AA. After AA, the researcher instructed participants to directly press the area where the patch was, with the same intensity, frequency, and time. To ensure the patches were held in place and did not move to other parts of the body, the researcher asked them to check the areas where the patches were while introducing pressure to the patch areas.

Data analysis

The collected data were analyzed using the SPSS/WIN version 21.0, and the statistical significance was set at $P < .05$ Homogeneity of the verum (experimental) and sham (control) groups was analyzed by an χ^2 test, Fisher's exact test, and independent t test. Changes in blood pressure, pulse, and pulse pressure between the 2 groups over time were analyzed by repeated-measures analysis of variance (ANOVA). Group differences in terms of physiological indicators, depression, anxiety, and stress between the verum (experimental) and sham (control) groups were analyzed by the independent t test while changes within the groups were analyzed by the paired t test.

Ethical approval

This study was initiated after obtaining the approval of the Institutional Review Board (IRB no: 138-33) at E University to ethically protect participants and scientifically validate the study. To obtain volunteer participants, the researcher directly visited each institution, explained the research, posted the recruitment documents, and recruited patients.

The researcher explained the purpose of the study, research methodology, procedures, protection of personal information, and risks and benefits to participants using terms and expressions that were easy to understand. Volunteer participants provided written consent, agreeing to participate in the study before the study began.

RESULTS

Supplemental Digital Content Table 1 (available at: http://links.lww.com/HNP/A12) shows the homogeneity test of the general characteristics, health-related characteristics, and dependent variables of participants. The verum (experimental) and sham (control) groups showed no statistically significant difference.

Systolic and diastolic blood pressure were measured by repeated-measures ANOVA for 8 weeks; and according to the results, there were significant changes in systolic ($F = 4.751$, $P < .001$) and

diastolic blood pressure ($F = 5.640$, $P < .001$) over time (see Figure 3). Although there were no significant differences in the systolic blood pressure depending on AA provided to the verum (experimental) and sham (control) groups ($F = 0.907$, $P = .346$), the diastolic blood pressure ($F = 11.500$, $P < .001$) showed a significant change (see Supplemental Digital Content Table 2, available at: http://links.lww.com/HNP/A13). There was no significant interaction between group and time in either systolic or diastolic blood pressure. To examine the tendency of increase and decrease in systolic and diastolic blood pressure, the differences between the blood pressure measured every week and the premeasured blood pressure were analyzed through the *t* test (see Supplemental Digital Content Table 3, available at: http://links.lww.com/HNP/A14). Systolic blood pressure tended to decrease with time. Particularly, the blood pressure measured after 8 weeks of intervention and the premeasured blood

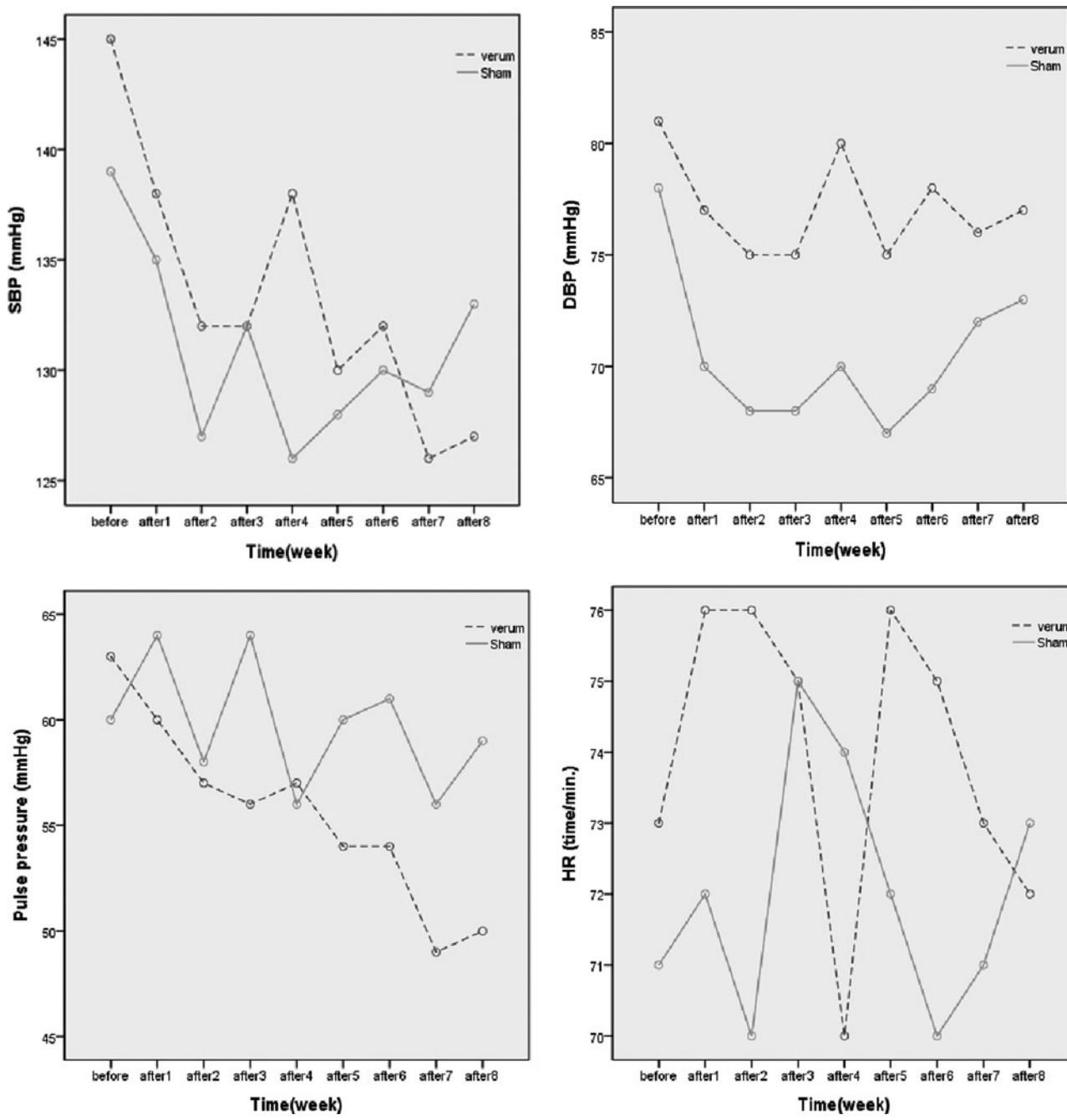

FIGURE 3. Change in dependent variables over time.

pressure were significantly different between the 2 groups; therefore, it confirmed that at least 8 weeks of intervention was required. On the other hand, diastolic blood pressure tended to decrease in both the verum (experimental) and sham (control) groups, but a significant difference between the 2 groups was observed after 4 weeks ($t = –2.722$, $P = .009$) and 6 weeks of intervention ($t = –2.102$, $P = .041$). At that time, it was possible to see a more significant decrease in diastolic blood pressure in the sham (control) group.

Pulse pressure and heart rate were also measured weekly for 8 weeks and analyzed with repeated measures ANOVA (see Supplemental Digital Content Table 2, available at: http://links.lww.com/HNP/A13). There were significant changes in pulse pressure ($F = 4.372$, $P = .001$) and heart rate ($F = 2.286$, $P = .042$) with time (see Figure 3), but changes in pulse pressure and heart rate were not significant depending on AA. However, the correlations between the 2 groups and time were significant in both pulse pressure ($F = 3.189$, $P = .007$) and heart rate ($F = 4.031$, $P = .002$). Comparing the premeasured pulse pressure with the weekly measured pulse pressure, the pulse pressure of the verum (experimental) group significantly decreased from the sixth week of intervention compared with the sham (control) group ($t = 2.432$, $P = .020$). On the other hand, the heart rate of the verum (experimental) group significantly decreased after 4 weeks of intervention compared with the sham (control) group ($t = 2.450$, $P = .020$), but there was no significant difference in changes of the heart rate (see Supplemental Digital Content Table 3, available at: http://links.lww.com/HNP/A14).

No statistical difference emerged between the groups after AA in depression, anxiety, and stress (see Supplemental Digital Content Table 4, available at: http://links.lww.com/HNP/A15). However, depression, anxiety, and stress in the verum (experimental) and sham (control) groups significantly decreased.

DISCUSSION

According to the systolic blood pressure measured in the verum (experimental) and sham (control) groups, there was no correlation between AA and interval. Therefore, changes in systolic blood pressure in the verum (experimental) and sham (control) groups appeared to decrease in a similar pattern. However, there was a statistically significant decrease in systolic blood pressure in the verum (experimental) group, and it significantly decreased in the verum (experimental) group after 8 weeks compared with the sham (control) group. This result is similar to the findings reported by some studies in which blood pressure was reduced after applying AA to hypertensive elderly women[18] and in adults with hypertension after receiving the combined intervention of abdominal acupuncture and AA.[17] Therefore, the auricular points like Shenmen, kidneys, and back of the head, which were the points selected in common with previous studies,[17,18] were considered to be effective in reducing systolic blood pressure.

On the other hand, diastolic blood pressure was shown to have no correlation between AA and measurement period in both the verum (experimental) and sham (control) groups, whereas there were significant changes in the groups and measurement period. In the case of diastolic blood pressure, it significantly decreased over time within both the verum (experimental) and sham (control) groups. Also, significant differences between the groups were observed after 4 and 6 weeks of intervention, and at that time, diastolic blood pressure of the sham (control) group significantly decreased. These results were similar to the results of a study that reported no differences in the control group after simultaneously applying abdominal acupuncture and AA to obese hypertensive adults; however, a significant decrease in diastolic blood pressure within the verum (experimental) group was found to be similar.[21]

According to the result, both systolic and diastolic blood pressure decreased in the verum (Experimental) and sham (control) groups. Unlike previous studies,[16-18] which compared the experimental group with nursing intervention and the control group without any treatments, sham (control) AA was applied to determine the physiological changes of the sham (control) group; thus, a placebo effect was observed. In addition, sham (control) AA applied to the sham (control) group also targeted the knees, so it resulted in alleviated knee pain in the patients. Therefore, it seems that the response of the autonomic nervous system was stabilized when the patients experienced pain, so it may have affected blood pressure reduction. For identification of physiological indicators, blood pressure and pulse were measured at the same points, using the same method; however, it was not possible to control temperature differences due to seasonal changes or weather changes during the study period. There was a study that examined the

effects of temperature stimulation using environmental temperature on blood pressure, and the result of that study was similar to the findings of this study in which the systolic and diastolic blood pressure were higher in cold environments.[24]

In the case of pulse pressure, which was measured for 8 weeks, the group difference was significantly observed after 6 weeks of intervention, but it significantly decreased in the verum (experimental) group. Such a result supports a study[17] that verified the reduced pulse pressure by applying AA to hypertensive elderly women. In the elderly, hypertension is characterized by a significant increase in systolic blood pressure due to atherosclerosis and low diastolic pressure due to reduced coronary flow. As a consequence, the pulse pressure, which is the difference between systolic and diastolic blood pressure, is significantly higher.[22]

According to a study that examined the prevalence of metabolic syndrome, including pulse pressure and hypertension, with 6187 people 60 years or older, the risk of metabolic syndrome became 1.8 times higher for men and 1.6 times higher for women when pulse pressure increased by 20 mm Hg, and high pulse pressure triggered faster cognitive decline rate, accelerating the onset of dementia.[24] In this respect, effective interventions to reduce systolic and diastolic blood pressure and decrease pulse pressure in elderly people with hypertension are needed. According to the results of this study, AA was effective in reducing pulse pressure in elderly people with essential hypertension.

Heart rate reduction was not statistically significant between the 2 groups, and the amount of pulse change caused by repeated measurements was also not significant. However, the researcher found a significant group-by-time interaction, indicating that AA intervention leads to a reduction in heart rate.

Results from this study were not consistent with results from previous studies that reported no effect on pulse reduction after applying AA to hypertensive patients.[16,18] However, these results were consistent with the result of a study by Yu et al[25] that showed a significant group difference in heart rate reduction by applying ear massage and ear thermotherapy to adult women in their 20s and 30s. Likewise, effects on heart rate examined in various studies differed because methods, instruments, and periods implemented for measurement were different and situations or environments at the time of measurement influenced participants' sensitivity to change.[24]

In this study, the differences before and after the intervention were compared based on the scores of depression, anxiety, and stress. There was no statistically significant difference between the verum (experimental) and sham (control) groups; however, depression, anxiety, and stress significantly decreased in each group after applying AA. Such a result is similar to a study[26] that reported no significant differences between the experimental and control groups in terms of stress and anxiety regardless of the reduced level after applying aroma inhalation daily for 2 weeks to hypertensive adults. Although the study subjects were not hypertensive, a study that applied AA to postnatal women who just went through a cesarean section reported reduced stress-related cortisol levels and anxiety symptoms in the experimental group and no significant difference in the control group.[27] Such findings are similar to the results obtained in this study.

Most studies identified only physiological indicators associated with hypertension.[17,21,22,28,29] Also, few studies have assessed the effects of the intervention on sociopsychological variables of hypertensive subjects; they have only assessed the quality of life of participants.[16,18] In this study, the researcher compared the verum (experimental) and sham (control) groups, unlike studies in which the control group received no treatment. Using the blinded method in this study prevented participants from knowing whether they were in the verum (experimental) or sham (control) group; when participants have such knowledge, attempting any therapeutic act could affect the outcome for elderly people with chronic diseases who have a higher level of stress than the general population. In this study, depression, anxiety, and stress scores significantly decreased in both the verum (experimental) and sham (control) groups, suggesting that the difference between the groups was not significant before or after AA.

Generalizing results from this study to the whole population should be conducted cautiously because the sample size was small. Also, because the researcher did not control other factors influencing hypertension, such as genetic characteristics or dietary habits, careful attention should be paid when applying the results of the study. In addition, changes in physiological parameters related to temperature difference due to seasonal changes during the study period could not be overlooked, and the researcher directly conducted AA and investigation before, in the

middle of, and after the intervention. To examine the effects of AA on improvement of sociopsychological variables, it is necessary to consider the points of ear reflexology to apply sham (control) AA and to apply long-term intervention. Also, validation is required even after the end of the intervention. AA has almost no side effects and is noninvasive; thus, it is easily applied by a nurse using simple materials and devices. For this reason, it is an effective intervention program to continuously apply to elderly people with hypertension.

CONCLUSIONS

Although no statistically significant difference emerged between the groups in heart rate, depression, anxiety, and stress, the level of depression, anxiety, and stress decreased in the verum (experimental) and sham (control) groups. Thus, AA may serve as an effective intervention for positive change in physiological indicators, depression, anxiety, and stress in elderly people with essential hypertension. In addition, this study attempted to examine the effects of AA on physiological parameters and sociopsychological variables by applying AA to patients with hypertension. AA was applied to the sham (control) group to ensure a scientific study design. Also, the effective intervention period was verified by checking the amount of change every week through repeated measures of outcome variables. Based on these considerations, AA may serve as a validated health care intervention for the physical and mental health management of elderly people with essential hypertension.

AA was applied to elderly people with essential hypertension, and its effects were shown to reduce systolic and diastolic blood pressure and pulse pressure. Because no signs of side effects arose, applying AA is an effective health care intervention program for elderly people with essential hypertension. This study targeted elderly people in a local community. Therefore, results suggest promoting future studies for hospitalized patients. Among the physiological indicators of hypertensive patients, only blood pressure, heart rate, and pulse pressure were measured. Therefore, blood lipid level should be examined as an objective indicator of hypertension. Because AA reduced blood pressure and pulse pressure, further studies should discern whether increasing the duration of the intervention validates the effects of AA. An investigation was conducted a week after the end of AA. A follow-up study should be conducted to confirm the effects of long-term AA after a certain period.

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