



Abdominal and auricular acupuncture reduces blood pressure in hypertensive patients



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ABSTRACT

Introduction: Hypertension is an important risk factor of cardiovascular disease (CVD), which is associated with premature death, myocardial infarction, stroke, peripheral vascular disease, and renal disease. The goal of the present study was to use a randomized controlled clinical trial to explore and compare the effectiveness of abdominal and auricular acupuncture on blood pressure in 440 subjects with and without obesity.

Methods: Four hundred participants were recruited and randomized to one of four groups: cases and controls receiving auricular acupuncture (204 subjects) and cases and controls receiving abdominal electroacupuncture (196 subjects). Blood pressure and anthropometric parameters were measured before and after the intervention period. In order to match the initial diet of the groups, participants were required to follow an isocaloric diet for two weeks before the trial, and a low-calorie diet for 6 weeks during the intervention period.

Results: We observed a significant time dependent improvement in the systolic blood pressure measurements in the abdominal intervention group, although this improvement was more pronounced in the first period of study. Of note, in the auricular intervention group, a significant increasing in the level of SBP was detected. Importantly no statistically significant changes were found in the corresponding sham groups.

Conclusions: Our findings demonstrated that abdominal electro-acupuncture for 6 weeks reduced both systolic and diastolic blood pressure and auricular acupuncture had a short-term adverse effect on both SBP and DBP.

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1. Introduction

Hypertension is the most prevalent cardiovascular disorder risk factor.^{1–3} Hypertension is known to increase susceptibility to several other conditions, including premature death, myocardial infarction, stroke, peripheral vascular disease, and renal disease.^{2,3} There is growing body of evidence showing an association between obesity and increased blood pressure.⁴ We have

previously reported that weight and BMI were significantly higher in patients with increased blood pressure compared to healthy subjects.⁵ Hypertension can be managed in several ways such as, lifestyle changes; restricting the intake of salt, meat and poultry, weight loss and exercise, and treatments offered by complementary medicine.^{4,5}

Several other interventions have been developed to manage hypertensive patients that include treatment with antihypertensive drugs and acupuncture. Acupuncture is a method for restoring balance of Qi, the life force that circulates throughout the body in energy pathways that are called meridians, by stimulating specific points over the surface of body known as acupuncture points or acupoints.⁶ Drug therapies may be associated with unwanted multi organ side effects,⁵ and maintaining lifestyle changes is often dif-

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ficult to sustain.² Hence complementary medicine interventions, particularly acupuncture, have increased in popularity, in recent years.⁵ The effect of acupuncture on blood pressure has been evaluated previously, and has been shown to be effective when used alongside the patients' routine medications, or when used alone.⁵ Although there have been several studies conducted to assess the effectiveness of acupuncture on lowering blood pressure, there have been no studies comparing the efficacy of auricular acupuncture and abdominal electroacupuncture interventions on blood pressure in relation to adiposity.^{6,7} In the present study we aimed to compare the effectiveness of auricular acupuncture and abdominal electroacupuncture and have assessed the possible relationship between anthropometric parameters and the effectiveness of these interventions.

2. Methods and subjects

2.1. Study design and subjects

Four hundred and forty overweight and obese subjects were recruited from the nutrition clinic of Ghaem hospital, Mashhad, Iran. In this investigation, overweight was defined as a body mass index (BMI) of 25 to <30, and a BMI of ≥ 30 was defined as obesity. None of the subjects had received any other weight control measures, nor did they have any medical and/or drug history within the last three months prior to participating in the study. Volunteers were informed about the investigation verbally and using written information. Subjects were given time to decide whether to take part in the study, and discuss any questions they had about the investigation. Each participant gave informed written consent to be enrolled in the investigation, which received the approval of Mashhad University of Medical Sciences Ethics Committee. The exclusion criteria were: diabetes, pre-existing heart disease, endocrine disorders and pregnancy. Individuals who did not wish to continue at any point in the study were withdrawn from the study. Four hundred subjects were initially enrolled into the study and were randomized into one of four groups, consisting of 2 groups of cases and controls for auricular acupuncture (each group consisted of 102 subjects) and 2 groups of cases and controls for abdominal electroacupuncture (each group consisted of 98 subjects). Each patient was given a number between 1 and 4, and each number was assigned to one of our study groups. As the setting of authentic and sham interventions were almost the same with only minute differences which would not seem important to the participant, neither participants nor the researchers knew which group received authentic intervention and which group underwent sham intervention. Only the acupuncturist was informed of group allocations to use the appropriate intervention for each participant. The subjects were between 18 and 55 years old and had a BMI between 25 and 45 kg/m². Blood pressure, anthropometric and biochemical parameters were measured before and after the intervention. In order to match the initial diet of the groups, participants were required to follow an isocaloric diet (wash-out diet) for two weeks before starting the trial. They were then instructed to follow a low-calorie diet for 6 weeks. The low-calorie diet consisted of 1000 kcal deficit per day less than the individual's daily energy expenditure. The resting energy expenditure was calculated using the equation of Harris Benedict.⁸ and was used to determine the amount of food to be consumed per day for the participants. The wash-out diet and the 6-week dietary program for each participant was designed by a nutritionist according to the participant's energy expenditure. The diet was assigned and the participants' compliance was monitored on a weekly basis.

Diabetes was defined by a fasting blood glucose of ≥ 126 mg/dL on ≥ 2 occasions or treatment with hypoglycemic medications, and

hypertension by blood pressure $\geq 140/90$ mmHg on ≥ 2 occasions or if patient was being treated with anti-hypertensive drugs.⁹

2.2. Interventions

2.2.1. Abdominal electroacupuncture treatment

Traditional Chinese style electro-acupuncture was used in accordance with the Advanced Textbook of traditional Chinese Medicine and Pharmacology, and the textbook of Acupuncture and Moxibustion Administration Methods.^{10,11} In each session, four needles were inserted for each subjects. The acupoints chosen were:¹ tianshu (ST25) on both sides,² weidao (GB28) on both sides,³ zhongwan (RN12),⁴ shuifen (RN9),⁵ guanyuan (RN4), and⁶ sanyinjiao (SP6). Additional acupoints for patients with excess pattern were¹ quchi (LI11) and² fenglong (ST40); and for patients with deficiency pattern were¹ qihai (RN6) and² yinlingquan (SP9). Phlegm-dampness or phlegm-heat were considered as excess pattern; and spleen/stomach qi deficiency or primary qi deficiency were considered as deficiency pattern. These patterns were determined by their different signs, symptoms, age, diet, digestion, family medical history, emotion, lifestyle, and gastric or splenic or renal hypofunction. As in gastric and splenic hypofunction dampness cannot be transformed, it results in internal phlegm-turbidity. Normal 3.8 cm Chinese-made Huan-Qui needles were inserted 1 cun deep into the tissue, seeking a pain response. During each session, two needles were inserted into tianshu (ST25) and two needles into weidao (GB28) bilaterally. The needles were connected to the acupuncture machine [Ying Lee, KWD 808, China] with one electric wire. The machine was set to generate dense-disperse-wave impulse at a frequency of 30–40 Hz at the maximum tolerable intensity (390 μ S square pulse, 500 Ω , 12–23 V), which made painless yet strong sensation for the patient. In case of a diminished sensation during a treatment session, output current would be slightly increased.

In the sham abdominal acupuncture group, needles for the acupoints which were on the RN meridian were inserted 0.3 cun lateral to the authentic acupoints. Other needles were inserted 0.5 cun upwards and 0.5 cun lateral to the authentic acupoints. All needles of the sham group were inserted as superficially as was possible. Electric wires for the sham group were connected to the same machine, however no electricity was being generated by the acupuncture machine in the sham group.

All of the needles for both study groups were kept in their place for about twenty minutes. The procedure was carried out throughout the study by one of the authors, HA; who has a 10-year experience in acupuncturing. Abdominal acupuncture details are demonstrated in Table 1.

2.2.2. Auricular acupuncture treatment

Standardized acupoints were identified based on the theory of Chinese medicine, and treatment procedure was developed according to "Advanced Textbook of traditional Chinese Medicine and Pharmacology" and "The Textbook of Acupuncture and Moxibustion". Six acupoints on the ear were chosen which were Shen Men (TF4), Mouth (CO1), Stomach (CO4), Hunger point, Sanjiao (CO17), Center of Ear (HX1) in the case group ear-pressing plaster with seed 22 was applied routinely on them (Fig. 1). The acupoints were sterilized with 75% alcohol preparation pads, then, the ear-pressing plaster were inserted with seed into the acupoints. The acupuncturist applied the ear-pressing plasters to acupoints on one ear in each visit and they were kept on the ear for three days. We requested all participants to put pressure on the auricular points for about 20 s 30 min before eating. They had 2 sessions weekly for 6 weeks in total, and seed plasters were changed once every 3–4 days. Acupuncture was carried out on the ear points on one ear in

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