RESEARCH ARTICLE

Cardiovascular Effects of Acupuncture at Sympathetic Auricular Point

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Abstract

Objective: This study aimed to analyze the effect of acupuncture in Sympathetic auricular point on arterial pressure changes in healthy subjects.

Design: A kinetics cross-sectional experimental study was conducted at Clínica de Acupuntura, Unidad Iztapalapa, Universidad Autónoma Metropolitana, México. Participants: twenty healthy university students (four women) aged 22.8 ± 1.6 in women and 23.4 ± 2.6 in men (mean ± SD) participated in the present study to investigate the kinetics of the acute effect of acupuncture stimulation at Sympathetic auricular point on cardiovascular functioning.

Interventions: The study consisted of two manual auricular acupuncture sessions in the Sympathetic point in the right or left ear. The following data for every heartbeat: Mean arterial pressure (MAP), cardiac output (CO), total peripheral resistance (TPR), heart rate (HR), and stroke volume (SV) were computed.

Results: Acupuncture in the right-side Sympathetic point increase MAP and CO and reduce TPR. Otherwise, acupuncture in the left-side Sympathetic point increases CO and reduces TPR without a change in MAP. Otherwise, only the right-side Sympathetic point increases both MAP and SV. Both auricular points reduced the TPR.

Conclusions: These results suggest an acute effect of manual acupuncture in Sympathetic auricular point on the cardiovascular parameters of mean arterial pressure and cardiac output. We also show that acupuncture on the right or left-side Sympathetic points have different effects. These results emphasize the importance of experimental studies on the potentially sided effects of auricular acupoints to reinforce the rational clinical application of auriculomedicine.

Keywords: Sympathetic auricular point, mean arterial pressure, cardiac output, total peripheral resistance.
INTRODUCTION

Auricular acupuncture is a method that has been successfully used in various ailments, especially in the treatment of pain relief, (1, 2) hypertension, (3) postoperative pain. (4) Some studies have suggested that auriculotherapy modulates the autonomic nervous system and changes activity in the sympathetic and parasympathetic nervous system. (5) Also, the relationship between auricular acupuncture and vagal regulation has been reviewed. (6) It has been shown that auricular acupuncture could modify vagal activity related to cardiovascular system functioning. (7) A recent study showed that Sympathetic point changed the heart rate variability in subjects under active standing test. (8) We hypothesized that acupuncture at the Sympathetic auricular point modulates the factors that determine the mean arterial pressure, cardiac output, and its parameters. Therefore, this study was performed to explore the effect of auricular acupuncture in Sympathetic points on arterial pressure changes in healthy volunteers.

MATERIALS AND METHODS

Study design. This study was a cross-sectional, experimental study to observe the auricular acupuncture effect at the Sympathetic point on various hemodynamic parameters, such as MAP, CO, TPR, HR, and SV in healthy participants.

Subjects

Twenty healthy student volunteers, adults (13 female), 21 – 29 years of age, (22.8 ± 1.6 in women and 23.4 ± 2.6 in men, age in year ± SD) belonging to the Universidad Autónoma Metropolitana, campus Iztapalapa, México participated in the study. The subjects had no history of cardiovascular or metabolic diseases, nor were they taking any medication to modify the autonomic nervous function.

2.1.1 Ethical aspects

The institutional Biological and Health Division Ethics Committee approved this study (Approval Number 15.04.16). The study was conducted by following the principles of the revised version of the Declaration of Helsinki (World Medical Association 2013). All subjects received detailed information about the nature of the study and gave their informed written consent.

2.2 Instrumentation and recordings

A continuous beat-to-beat blood pressure (BP) data from our sample of 20 subjects was used in the present study. A finger cuff was placed in the middle phalanx of the left middle finger, with the hand positioned at heart level (Finometer; Finapres Medical Systems, Amsterdam, The Netherlands), and arterial pressure was recorded continuously. (9) The Finapres system provides continuous and concurrent calculations of MAP, CO, TPR, HR, and SV and is commonly used in research settings. (10) Participants completed a supine resting recording period of 2 min. Data recorded estimate hemodynamic parameters using the Model flow method based on a three-element Windkessel model. (9) The CO, HR, SV, and MAP were calculated by BeatScope - v02.10 software (Finapres Medical Systems, Enschede, The Netherlands). This software allows online monitoring, control, storage, and offline revise of the complete Finometer data, including cardiac parameters. SVR was determined as the quotient of ModelFlow-derived MAP divided by CO. (11) The unit of measurement for ModelFlow SVR is CGS units, i.e., dys.s.cm⁻⁵.

Signal processing and analysis. All recordings were plotted and then averaged with the software Plot2 for Mac (Michael Wesemann, Berlin, Germany, 2019).

Supplementary information The online version of this article (10.15520/jmbas.v8i11.260) contains supplementary material, which is available to authorized users.

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2.3 | Acupuncture treatment

2.3.1 | Rationale

Auricular acupoint Sympathetic was selected for acupuncture stimulation because of its well recognized clinical cardiovascular effects.

2.3.2 | Auricular acupuncture

Manual acupuncture without additional electrical or laser stimulation was applied at the Sympathetic auricular point, Figure 1. The Sympathetic ear point is on the inside of the helix following the lower part of the antihelix crus wherein the needle was inserted vertically to a depth of 2 mm with no additional stimulation, and the needle remained inserted for one minute. Sterile acupuncture stainless steel needles that were 13 mm long, 0.22 mm diameter, with a plastic handle (HBW Supply Inc., San Jacinto Hemet, CA, USA) were used.

![FIGURE 1: Auricular Sympathetic point](image)

2.3.3 | Practitioner’s Background

One acupuncturist, with more than five years of experience, performed all the acupuncture stimuli.

2.4 | Study protocol

The subjects were instructed not to drink alcohol for ≥ 24 h before the experiments; and not to have a heavy meal two h before each experiment. During the study, the subjects remained supine. After registering its clinical information, each subject was at rest for ≥15 min before starting the records. The measurements were taken between 9:00 a.m. to 12:00 p.m. to standardize the circadian variations in blood pressure. All the records were made with the patient in the supine position. After the rest period, the Finapres finger cuff was affixed to the middle finger of each subject. Data recording commenced, and after one-minute registration, acupuncture in either the right-side or the left-side of the Sympathetic auricular point was applied for an additional record of 60 seconds. After the needle was removed, the recording was stopped. This study was 13 paired records with the same experimental protocol, performed in the same laboratory. The outcome variables were: MAP, CO, TPR, HR, and SV, and an experimental crossover model was used with a one-week difference between the treatments in the right-side and left-side Sympathetic points. Recordings were made on the right ear and after a one-week washout period on the left ear. Figure 2 shows the experimental sequence.

![FIGURE 2: Experimental sequence](image)
2.4.1 Outcomes and comparisons

The signals were obtained and processed using the Finometer equipment (Finapres Medical Systems BV, Mod MIDIS / N FM1.MU.00908, Amsterdam, Holland), coupled with a computer that digitized the signal analyzed through BeatScope Easy software. (9) Records of the following cardiovascular variables were obtained: mean arterial pressure, cardiac output, total peripheral resistance, heart rate, and stroke volume. The records of each subject in the transacupuncture period of 60 seconds were plotted in the Plot2 software (Michael Wesemann, Berlin, Germany, 2019). Interpolated data for the 20 subjects for that period were averaged, and a kinetic curve of the acupuncture effect was obtained for every parameter. Subsequently, the curves corresponding to each variable were gathered in a single graph.

3 RESULTS

MAP and its parameters. Continuous and noninvasive measurement of cardiovascular parameters is essential for a better understanding of the mechanisms of acupuncture. The time courses of the beat-to-beat changes of CO, HR, and SV are shown in Figure 2. CO is the blood volume the heart pumps per minute and calculated by multiplying the stroke volume by the heart rate. As soon as the auriculopuncture treatment was started, HR and SV steadily decreased, and therefore CO diminished.

The changes in MAP and its parameters CO and TPR during the 60-second auriculopuncture in the right-side Sympathetic point are shown in Figure 3. It is observed that MAP and CO present an increase; otherwise, TPR presented a decrease during this period. During the initial 10-seconds, CO and TPR presented a biphasic opposite behavior; and MAP presents a steady decrease.

The changes in CO and its parameters HR and SV during the 60-second auriculopuncture in the right-side Sympathetic point are shown in Figure 4. It is observed that CO, HR, and SV present an increase decrease during this period. During the initial 10-seconds, CO and SV presented a similar biphasic behaviour; as well as HR.

The changes in MAP and its parameters CO and TPR during the 60-second auriculopuncture in the left-side Sympathetic point are shown in Figure 5. It is observed that CO presented an increase, and TPR a decrease during acupuncture; whereas, MAP have no changes at the end of this period. During the initial 10-seconds, CO and MAP showed an opposite behaviour.

The changes in CO and its parameters HR and SV during the 60-second auriculopuncture in the left-side Sympathetic point are shown in Figure 6. It is observed that CO, HR, and SV present an increase at the end of this period. During the initial 10-seconds, CO, HR, and SV present and increase and consequently decrease except for SV.
FIGURE 4: Cardiac output (CO) and its parameters heart rate (HR) and stroke volume (SV) during acupuncture at the right-side Sympathetic point: A. period of 60 and B. ten seconds, respectively.

4 | DISCUSSION

The main findings of this study were:
- Acupuncture in the right-side Sympathetic point increases MAP and CO and reduces TPR. HR and SV both contribute to the increase in cardiac output.
- Acupuncture in the left-side Sympathetic point increase CO and reduces TPR without a change in MAP. The increase in CO is mainly related to an increment in HR.
- Only the right-side Sympathetic point increases both MAP and SV. Otherwise, both auricular points reduced the TPR.

Auricular acupoints have been shown to improve cardiovascular diseases (12) and elicit peripheral vascular modifications. (13) The present findings demonstrating a correlation between needling the Sympathetic auricular acupoint and an increased CO and probably indicates that this procedure evoked a sympathetic response. These results are in line with a previous report that showed a sympathomimetic effect in volunteers when they received ear acupuncture stimulation in the treatment of obesity. (14) Another study showed that the evoked sudomotor response by Sympathetic point stimulation could be related to an enhanced sympathetic activity. (15)

5 | CONCLUSIONS

In conclusion, this study demonstrated an acute effect of manual acupuncture in Sympathetic auricular point on the cardiovascular parameters of mean arterial pressure and cardiac output. We also show that acupuncture on the right-side or left-side Sympathetic points has different effects. These results emphasize the importance of experimental studies on the potentially different effects of auricular acupoints to reinforce the rational clinical application of auriculomedicine.
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FIGURE 6: Cardiac output (CO) and its parameters heart rate (HR) and stroke volume (SV) during acupuncture at the left-side Sympathetic point: A. period of 60 and B. tenseconds, respectively.

REFERENCES


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