EFFECT OF ACUPUNCTURE IN HEART AURICULAR POINT IN TWO INDEXES OF DIGITAL VOLUME PULSE IN HEALTHY SUBJECTS

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ABSTRACT

Objective: The aim of the study was to determine the changes in two indices derived from the digital volume pulse (DVP) elicited by acupuncture in auricular heart acupoint in healthy subjects.

Methods: Eighteen healthy subjects aged 26.22±2.98 years (mean±standard deviation) were assigned to receive auricular acupuncture in auricular heart acupoint in the right ear. The DVP was recorded by photoplethysmography. Ri was determined by the relative amplitudes of systolic and diastolic components of the DVP and SI by the relative timing of these components. Auricular acupuncture heart was stimulated by manual acupuncture. The RI and SI indices were calculated for basal and post-acupuncture conditions.

Results: Both RI (p=0.0375) and SI (p=0.0063) were significantly decreased by acupuncture of the right auricular acupoint heart when comparing the pre- and post-acupuncture values.

Conclusions: These results indicate that manual acupuncture of auricular acupoint heart produces acute effects on vascular physiology. RI and SI indices can be used to assess and demonstrate a vasodilatory activity of auricular heart acupoint.

Keywords: Heart auricular point, Reflection index, Stiffness index, Photoplethysmogram.
stainless steel needles (Hwato, Suzhou, China). The acupuncture needle was manually inserted into the auricular acupoint heart in the right auricle (Fig. 3) without additional electrical or laser stimulation, gently stimulated for 5 s, and needle remained in situ 1 min. Concerning the primary objective of the study, the clinical investigator calculating the DVP indices was blinded respect to if the data belonged to the basal of post-acupuncture period.

Study protocol

All subjects abstained from caffeine or smoking in the previous 12 h. Measurements were made with subjects in the supine position after a fast night to reach standard conditions and after at least 20 min rest in a quiet and temperature-controlled clinical room (24±1°C). In each subject, a 6 min long registration DVP was obtained. The acupuncture needle was inserted into the heart auricular acupoint in the right ear at 2 mm deep. The needle was maintained in place for 1 min (2–3 min) and removed after that contralateral to the side of the DVP recording.

Statistical analysis

Data are presented as means±standard deviation. Normally distributed continuous variables were compared using Student’s t-test. p<0.05 was considered statistically significant. All testing were two sided. Statistical analyses were carried out using the SPSS software v. 21.0 (SPSS Inc., Chicago, IL, USA).

Table 1: Comparison of DVP indices in healthy subjects in the pre- versus post-acupuncture periods

| DVP index | Pre-acupuncture | Post-acupuncture | p-value |
|-----------|----------------|-----------------|--------|
| RI_DVP (%) | 68.4±4.5 | 60.3±3.6 | 0.0375* |
| SI_DVP (m/s) | 9.14±2.4 | 7.67±2.3 | 0.0063* |

RI_DVP: Reflection index defined as the height of the diastolic peak (a) expressed as a percentage of the amplitude of the systolic peak (b), i.e., RI_DVP = a/b*100.

SI_DVP: Stiffness index defined as h/Δt_DVP expressed in m/s, and Δt_DVP the time delay between the systolic and diastolic peaks. *p<0.05

RESULTS AND DISCUSSION

Acupuncture in the heart point of the ear elicited the following changes: A significant decrease of the RI_DVP (p=0.0375) from the baseline values to those of post-acupuncture and a decrease of SI_DVP (p=0.0063) when comparing baseline values to post-acupuncture, Table 1.

The effects of vasoactive drugs and nitrates in systemic hemodynamics are assessed through reflection and stiffness indices derived from DVP, such as changes in heart rate and blood pressure [10-12]. RI_DVP and SI_DVP have been used to study the mechanisms of acupoints, Rivas-Vilchis et al. [13] showed that manual stimulation of Shenmen and Knee auricular acupoints elicited acute changes in RI_DVP and SI_DVP.

DVP has a complex but predictable relationship to the aortic pulse pressure. DVP has a direct component arising from pressure waves propagating from the heart to the finger, as well as additional component derived from pressure waves generated in the peripheral arteries, mainly in the lower body, which reflects backward in the arterial system [4]. Therefore, the RI_DVP index provides a measure of the amount of wave reflection in the systemic circulation [12]. RI_DVP is also related to vasodilator stimuli [14,15]. Otherwise, SI_DVP is both associated with the time elapsed between the systolic and diastolic components of DVP and the pulse wave velocity in large arteries and, therefore, reflects large artery stiffness [4,5,9]. Hence, the present finding of a decrease in both RI_DVP and SI_DVP probably indicated that acupuncture in heart point evoked a vasoactive effect likely related to a vagal response.

CONCLUSIONS

Our results clearly showed the potential of auricular heart acupoint to modify RI_DVP and SI_DVP. These indices are valuable in assessing vascular tone and arterial stiffness. The present study has a potential limitation, that is, the unique analysis of the effect of acupuncture on the right ear. Therefore, contour analysis of the DVP can be used to assess the
cardiovascular outcomes and the related mechanisms of auricular acupoints.

AUTHORS' CONTRIBUTIONS

MMSM and JFRV contribution includes study design, experiments, and drafted an original manuscript. MMG and MSCR carried out the data analyses and reviewed the drafted manuscript. JFRV elaborated the final version of the manuscript. All authors approved the final version of the manuscript.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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