



Acupuncture induced changes in vagal function, blood pressure, and depressive symptom: A study of randomized, double-blind, sham-controlled trial for major depression



Yoshihiro Noda^{a,b,c}, Takuji Izuno^a, Chiaki Osawa^a, Misa Inoue^a, Hirohiko Murakami^a, Arata Ito^a, Yukari Shinse^a, Aya Suzuki^a, Shiro Obata^d, Yasuhiro Ochi^d, Motoaki Nakamura^a

^a Kinko Hospital, Kanagawa Psychiatric Center, Yokohama, Japan

^b Department of Neuropsychiatry, University of Tokyo, Tokyo, Japan

^c Centre for Addiction and Mental Health, University of Toronto, Toronto, Canada

^d MEDILINK Co., Ltd. Toyota, Japan

Background: Many patients with medication-resistant depression have undergone acupuncture in the western countries and its antidepressant effects have been well known empirically. However, therapeutic evidence of acupuncture is still limited due to a lack of applicable sham condition. We aimed to investigate the therapeutic and biological effects of acupuncture in the study.



Methods: The study design was a **randomized, double-blind, sham-controlled trial**.

Twelve healthy participants and thirty depressive patients were recruited and randomly assigned to either active or sham acupuncture for 3 days.

We used **Press Tack Needle (PTN)** and its sham needle. We applied the regimen for “**Tobu-Oketsu**” which means stagnation of blood in the head, potentially related to depression.

Before and after the PTN intervention, besides the psychological tests, Holter electrocardiogram (ECG) were conducted to evaluate autonomic function such as Coefficient of variation R-R interval (**CVRR**), Cardiac vagal index (**CVI**), Cardiac sympathetic index (**CSI**), and Very low frequency (**VLF**).

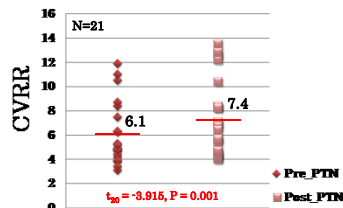
Each index was statistically compared with three-way analysis of variance (ANOVA), with time as a within-subject factor and intervention (active vs. sham) and group (healthy control vs. depression) as between-subjects factors.

Table. Results of BDI-II, hemodynamics, and autonomic functions between healthy controls and patients with depression

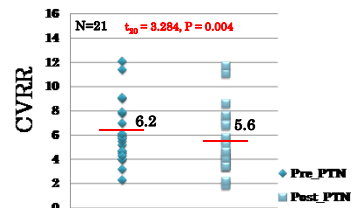
Indices	Healthy controls		Patients with depression	
	Before PTN	After PTN	Before PTN	After PTN
BDI-II	3.8 ± 3.5	2.5 ± 3.6	28.8 ± 13.6	24.0 ± 13.7
SBP	117 ± 9	116 ± 10	126 ± 16	123 ± 16
DBP	75 ± 7	74 ± 7	81 ± 13	78 ± 13
HR	67 ± 8	68 ± 7	70 ± 8	71 ± 8
CVRR	8.8 ± 2.7	9.2 ± 2.6	5.1 ± 1.5	5.4 ± 2.4
CVI	3.7 ± 0.4	3.8 ± 0.4	3.3 ± 0.4	3.3 ± 0.5
VLF	1122 ± 811	1369 ± 1014	509 ± 363	532 ± 360

Results: Three-way ANOVA revealed **significant time-by-intervention interactions** in Beck's depression inventory II (**BDI-II**) ($F_{1,38} = 5.003, P = 0.031$), **systolic blood pressure** ($F_{1,38} = 11.564, P = 0.002$), **diastolic blood pressure** ($F_{1,38} = 7.200, P = 0.011$), **CVRR** ($F_{1,38} = 16.383, P < 0.0001$), **CVI** ($F_{1,38} = 4.846, P = 0.034$) while no significant interactions were observed in **CSI** ($F_{1,38} = 1.088, P = 0.304$) and **VLF** ($F_{1,38} = 3.033, P = 0.090$).

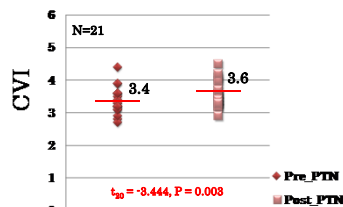
Longitudinal CVRR changes in active PTN acupuncture group



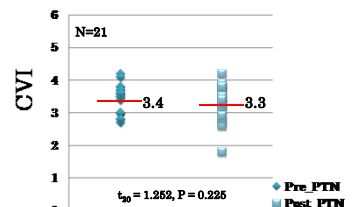
Longitudinal CVRR changes in sham PTN acupuncture group



Longitudinal CVI changes in active PTN acupuncture group



Longitudinal CVI changes in sham PTN acupuncture group



Conclusion: The 3-day intervention of PTN acupuncture might induce the alteration in vagal function, blood pressure, and BDI-II score in the study. The vagal stabilization may be associated with the therapeutic mechanism of acupuncture.