Original article

Relationships between oriental medical pattern diagnosis and cardiovascular autonomic function

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Abstract

Background: Autonomic nervous system (ANS) theory has similarities to holism in Oriental medicine (OM). The purpose of this study was to examine the relationships between OM pattern diagnosis and autonomic nervous function estimated by heart rate variability (HRV) parameters.
Methods: Two hundred and eighty-seven female patients ranging in age from 15 to 74 years (mean = 36.1 ± 10.1 years) were classified into five gynecological problem groups according to their: menstrual dysfunction, infertility, climacteric syndrome, post-operative, and post-labor management groups. They were asked to complete Yin Deficiency (YD), Phlegm pattern, and Cold–Heat questionnaires. Together with the pattern questionnaires, time domain (SDNN, and RMSSD), frequency domain (VLF, LF, HF, TP, and LF/HF), and nonlinear (ApEn) parameters of HRV were calculated using 5 min-ECG recordings.
Results: The Phlegm and Cold pattern scores had weak negative correlations with TP, LF, and HF in the menstrual dysfunction group. The Cold and Heat pattern scores had medium negative correlations with RMSSD, LF, and HF in the climacteric syndrome group. YD, Cold, and Heat pattern scores had medium negative correlations with ApEn in the post-operative management group. No relationships were seen between pathological patterns and HRV parameters in the infertility and post-labor management groups.
Conclusions: Phlegm, Cold, Heat and YD patterns should be more carefully considered in the treatment of gynecological problems in order to avoid increasing the risk of cardiovascular disease and depressive disorder in patients with menstrual dysfunction, climacteric syndrome, and post-operative management groups.
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Introduction

Oriental medicine (OM) characterizes unique physiological and pathological characteristics for understanding human health. Among these characteristics, "holism," or unity within the body, is one of the most important principles that differentiate OM from other medical systems. According to the holistic point of view, parts of the human body including the five viscera, six bowels, tissues, and bones, are interconnected and inseparable from

each other [1]. Holism is applied not only to physical aspects, but also to mental cognizance and emotions [1]. Therefore simultaneous examinations of physical and mental dysfunctions are critical when identifying pathological patterns [2].

It is interesting that autonomic nervous system (ANS) theory has similarities to holism in OM in that ANS theory is, like OM theory, the result of a combination of physical and mental activities and widely affects the whole body [3]. ANS is composed of sympathetic and parasympathetic nervous systems. The former refers to the mechanism which increases metabolic activity to deal with external challenges, while the latter refers to the growth and restoration of vital organs [4]. Among the diverse ANS measurements, heart rate variability (HRV) is most popular. HRV refers to the beat-to-beat fluctuations in the rhythm of the heart, or the way in which the time intervals between heart

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Table 1
Descriptive characteristics of the five gynecological problem groups.

Gynecological problem group ($n = 287$)	Age (year)	Symptom or sign
Menstrual dysfunction (n = 108)	30.6 ± 9.0	Menstrual clots (38.9%)[a], pain (37.0%), leukorrhagia (35.2%), dark-colored menstrual discharge (23.1%), irregular menstrual cycle (23.1%).
Infertility ($n = 59$)	34.0 ± 6.7	Pain (50.8%), menstrual clots (49.2%), leukorrhagia (37.3%), dark-colored menstrual discharge (30.5%), indigestion (27.1%).
Climacteric syndrome ($n = 44$)	50.7 ± 5.9	Flushing (54.5%), spontaneous sweating (52.3%), insomnia (45.5%), general fatigue (31.8%), indigestion (31.8%).
Post-operative management ($n = 31$)	39.9 ± 7.6	Menstrual clots (32.3%), pain (32.3%), dark-colored menstrual discharge (32.3%), general fatigue (25.8%), leukorrhagia (22.6%).
Post-labor management ($n = 45$)	35.0 ± 4.7	Pain (48.9%), general fatigue (44.4%), menstrual clots (40.0%), leukorrhagia (35.6%), spontaneous sweating (31.1%).

[a] Percentage indicates the frequency of the clinical symptoms or signs in each disease group.

beats (R–R intervals) change over time [5]. This variation results from the regulation of the sinoatrial node of the heart through the sympathetic and parasympathetic branches of the ANS [6]. After detecting R–R intervals, sympathetic and parasympathetic activities are estimated by time- or frequency-domain analyses. For example, high frequency (HF) is a major contributor reflecting parasympathetic (i.e., vagal) activity, while low frequency (LF) is dually mediated by both sympathetic and vagal activity [7]. Other than time and frequency domain parameters, the clinical utility of the nonlinear parameters of HRV has been suggested. For example, approximate entropy (ApEn) refers to the complexity of the R–R interval time series [8].

Vagal markers including HF have been suggested as risk factors of myocardial infarction (MI) and as mortality predictive parameters after MI [9]. Some studies found that vagal markers served as an indicator to estimate the effectiveness of physical activity [10], exercise training [11], and weight reduction [12]. Together with physical problems, some studies have shown that depressive disorder is related to low levels of vagal activity especially after-MI [13], whereas sympathetic activity increased under stress conditions [14].

HRV parameters have been proposed as a tool to diagnose pathological patterns or to monitor therapeutic effectiveness in OM fields. Despite the contradictory results of a recent systematic review of acupuncture effects on HRV [15], some studies on the effects of acupuncture on HRV suggests that the technique enhances parasympathetic activity and decreases sympathetic activity [16–19]. Besides acupuncture therapies, HRV has been used to examine the effectiveness of herbal prescriptions, Qigong, slow breathing, music, and essential oil therapies [20–23]. In terms of OM pattern diagnosis, Lin et al. reported that the severity of Yin deficiency (YD) based on the Yin deficiency questionnaire (YDQ) [24] in cancer patients was associated with decreased ANS function [25]. In another study, Lin et al. reported that ANS function in patients with metastatic cancer was more impaired than function without metastatic cancer [26].

Previous research using HRV has demonstrated that gynecological patients showed cardiovascular autonomic dysfunction. Lee et al. reported that the LF/HF ratio was higher in a postmenopausal symptoms group [27]. Ushiroyama et al. reported that the sympathetic activity index was more dominant than

vagal index in female patients with climacteric symptoms [28]. However, to the best of our knowledge, few studies have examined which OM patterns are associated with ANS function according to specific gynecological problems. Considering that lowered HRV is a marker for increased risk of cardiovascular disease and depressive disorder, OM pathological patterns associated with ANS should be more carefully and intensively managed when treating gynecological patients. Accordingly, in the present study we examined the relationships between OM pattern diagnosis and ANS function as estimated by HRV parameters for women presenting with conditions in one of five gynecological problem groups.

Methods

Subjects and data collection

This study was a retrospective or chart review study. Data from pathological pattern questionnaires and HRV test results were examined for 287 female patients who visited the Women's Health Clinic of the Kyung Hee University Oriental Medical Hospital at Gangdong between April 2011 and February 2012 and who did not report any cardiac problems (including arrhythmia, atrial fibrillation, and ischemic heart disease). The female patients ranged in age from 15 to 74 years (mean = 36.1 ± 10.1 years), and their gynecological problems were divided among five categories: menstrual dysfunction, infertility, climacteric syndrome, post-operative management, and post-labor management. Post-operative patients visited the Women's Health Clinic in order to obtain East Asian medical management after they had undergone hysterectomy or myomectomy for adenomyosis, myoma, and ovarisis at the Women's Health Center of the Kyung Hee University Hospital at Gangdong. Post-labor management outpatients visited the Women's Health Clinic for the treatment of various symptoms including pain and fatigue after labor. Table 1 lists the age distributions and main symptoms of the five groups, respectively. Each patient was asked to complete the Yin deficiency questionnaire (YDQ), Phlegm pattern questionnaire (PPQ), and Cold–Heat questionnaire (CHQ) for 20 min [23,28,29] (Table 2). To avoid time intervals between