

Parkinson's Congress 2019: Measures of Heart Rate Variability in Patients with Idiopathic Parkinson's Disease- Fabiano Henrique Rodrigues Soares- University Center of Rio Grande do Norte

Fabiano Henrique Rodrigues Soares

University Center of Rio Grande do Norte, Brazil

Abstract

The aim of this study was to verify measures of Pulse rate / heart rate variability in patients with idiopathic Parkinson's disease. Seventy two male participants volunteered for the study, 36 with diagnosed Parkinson's disease and 36 asymptomatic individuals. We conducted ambulatory recordings of 10 minutes in orthostatic position after five minutes of rest. Data was collected with POLAR RS800CX cardiac monitor and then analyzed by Kubios HRV 2.0 software to get measures of time and frequency domains. We found reductions in most a part of collected indexes without correlation with disease duration or drugs dosage. The reductions of collected indexes reinforce the concept that Parkinson's disease alters the autonomic nervous system modulation.

Keywords: Parkinson's disease; Pulse rate; Autonomic nervous system

Abbreviations: NN: NN Interval (Inter-Beat Interval); RMSSD: Root Mean Square of Differences Between NN Intervals; SDNN: Standard Deviation of NN Intervals; PNN50: Percentage of NN Intervals Greater than 50 ms (Milliseconds); FFT: Fast Fourier Transform; LF: Low Frequency; HF: High Frequency; LF/HF: LF An HF Ratio; ECG: Electrocardiogram; HRV: Heart Rate Variability.

Introduction: Parkinson's disease is a neurodegenerative morbidity that leads to motor, psychiatric and sleep disorders. In terms of motor symptoms, postural instability, shaking, rigidity, and slowness of movements are the most common symptoms. There is loss of dopamine production in midbrain neurons, resulting in loss of dopaminergic innervations in the striatum. In addition to an extra pyramidal motor dysfunction, patients frequently show Autonomic Nervous System (ANS) disorders, even in early phases of the disease.

This disease can promote autonomic dysfunction by damage in hypothalamus, basal ganglia, formatio reticularis, cerulean and nerve vagus dorsal nuclei. Besides those pre-ganglia

structures, post-ganglia sympathetic neurons and other ANS structures are also affected.

There are assumptions that the neurodegenerative characteristics of the disease is also associated with indexes of Pulse Rate Variability (HRV). Changes in ANS in Parkinson's patients include perturbations in cardiovascular regulation, hypotension, especially in orthostatic position, and sexual dysfunction.

HRV indexes in time and cardiac frequency domains have proven useful measures in predicting cardiac arrhythmias, mortality risk by cardiac artery disease and various central nervous system disturbs, such as stroke, epilepsy, brain damages and other degenerative brain disorder.

Recently, authors evaluated the cardiovascular autonomic regulation in patients in several disease stages using short duration measures and reinforced the strategy efficacy as non-invasive strategy. Thus, the aim of this study was to verify measures of HRV in patients with idiopathic Parkinson's disease.

Materials and Methods: Seventy-two volunteer male participants were randomly selected in a university clinical center (UNP/Brazil). The sample included 36 patients with diagnosed Parkinson's disease (Parkinson Group PG) and 36 healthy individuals (Control Group=CG). We conducted measures of HRV using ambulatory recordings with 10 minutes of duration in orthostatic position, after a 5-minute rest period. The CG didn't have any kind of neurologic or cardiac disorder. In addition, they didn't use any quite medication and had no genetic relation with the patients.

Results and Discussion: Participant's anthropometric and clinical characteristics. There was no evidence of peripheral or autonomic neuropathy, including postural hypotension. Rest heart rate, Systolic Blood Pressure (SBP) or Diastolic Blood Pressure (DBP) did not differ between groups. Body weight was significantly different between groups but we have

no reason to believe that it interfered with the dependent variables.

The time domain of HRV in patients revealed accentuated reductions in RMSSD, SDNN, NN, pNN50 in comparison with CG in accordance with the literature. The frequency domain revealed consistent reductions in LF, HF and LF/HF in PG, in contrast with elevations on the same indexes in the CG. There was no correlation between age and time or frequency domains in any group. Parkinson's is a slow-progression disease and is, in general, related with shaking, rigidity in body members, as long as rigidity in muscles and slowness of movements. Some evidences suggest that a combination between genetic and environmental factors may be placed as causes of those symptoms.

In addition, the deregulation of cardiovascular control may be related with the peripheral or central physiopathology of the Parkinson's disease. Our findings support this hypothesis, once there were significant differences in HRV indexes between groups, denoting dysfunctions in the balance between sympathetic and parasympathetic control in cardiac activity. Earlier studies with Parkinson's patients, using tests in cardiovascular reflexes, have demonstrated repressed responses of cardiac frequency for various stimuli, like normal and deep breathing and Valsalva maneuver. Those findings describe autonomic responses, during only a limited period of time, with large individual variability, promoting a limited view of the autonomic mechanisms in control of cardiac activity

Conclusions: Reductions in HRV indexes, associated with the disease, reflect loss of sympathetic and parasympathetic balance, which may be result of structural damage caused by Parkinson's disease. HRV, as non-invasive technique, might represent a strong indicator of neuronal regulatory activity. Its use can represent a useful tool, not only for research, but also for early diagnosis and clinical behaviour of Parkinson's disease.

Note: This work is partly presented at 5th Global Experts Meeting on Parkinsons, Huntingtons & Movement Disorders , Oct 30-31, 2019 Tokyo, Japan