Assessing Autonomic Nervous System Imbalance in Post-COVID-19 Patients through Heart Rate Variability during Tilt Testing

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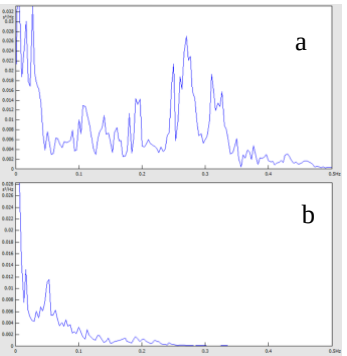
The COVID-19 has affected millions of people globally, and new symptoms and syndromes, such as "long COVID," are emerging. It is thought that autonomic nervous system instability, as a result of the virus, may explain these new patterns. However, there is still much to learn about the influence of SARS-CoV-2 on heart rate regulation and the sympathetic/parasympathetic system. This study aimed to evaluate heart rate variability (HRV) in post-COVID-19 patients during tilt test. The study involved five healthy volunteers (Control Group) and five individuals with confirmed COVID-19 history (Study Group). HRV was calculated in time domain, frequency domain, and nonlinear parameters, followed by a tilt test to assess dysautonomia affecting the autonomic nervous system. The results showed significant quantitative differences in the HRV parameters between the groups, including: VLF: 795.9 ± 276.3 ms² (GC) vs 643.1 ± 395.4 ms² (GE); LF 731.8 ± 205.3 ms² (GC) vs 541.2 ± 371.7 ms² (GE); HF 2016.7 ± 475.8 ms² (GC) vs 357 ± 387.8 ms² (GE); and LF/HF ratio 0.36 ± 0.9 (GC) vs 2.9 ± 1.9 (GE). The study found that an LF/HF ratio <1.0 in a healthy individual suggests that parasympathetic activity is relatively higher than sympathetic activity, indicating good cardiovascular health and autonomic nervous system balance. However, an LF/HF ratio > 1.0 in post-COVID-19 patients may indicate autonomic nervous system dysfunction, and a high LF/HF value may indicate an excessive sympathetic nervous system response. In conclusion, this study suggests that autonomic dysfunctions may exist in post-COVID-19 patients, as demonstrated by the significant changes in HRV parameters. However, caution should be taken in interpreting these results due to the variability of the LF/HF ratio value in different individuals' conditions. Further research is needed to better understand the impact of COVID-19 on the autonomic nervous system and heart rate regulation.



Power spectral density [ms^2].
a) CG, b) SG