Cardiovascular Dynamics in COVID-19: A Heart Rate Variability Investigation

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Argomento: Translational Abstract

Objective: COVID-19 is known to be a cause of microvascular disease due to the cytokine storm inflammatory response and the result of blood coagulation. This work aims at investigating the relationship between COVID-19 and cardiovascular alterations. Specifically, heart rate variability (HRV) time series has been analysed to inquire if there were some statistical differences between parameters extracted from Photopletismogram (PPG) signals of healthy subjects and same parameters extracted from different COVID-19 subjects, stratified by increasing severity index.

Approch: We aimed to determine a statistical differencestatistical analysis through Mann-Whitney U Test (MWUT) was applied to compare 43 different parameters extracted from PPG signals of 143 subjects: 50 healthy subjects (i.e. group 0) and 93 affected from COVID- 19 patients stratified through increasing COVID severity index (i.e. groups 1 and 2).

Main results: Results showed significant statistical differences between groups in several HRV parameters. In particular, Multiscale Entropy (MSE) analysis provided the master key in patient stratification assessment. In fact, MSE11, MSE12, MSE15, MSE16, MSE17, MSE18, MSE19 and MSE20 keep statistical significant difference during all the comparisons between healthy subjects and patients from all the pathological groups. Results indicate a decrease in entropy values from healthy subjects to the first level of COVID-19 severity, with further decrease at higher levels of the pathological condition, suggesting a corresponding increase of the regularity of HRV time series with the worsening of the impact of COVID-19.

Significance: Our preliminary results suggest that it could be possible to distinguish between healthy and COVID-19 affected subjects based on cardiovascular dynamics. This study opens to future evaluations in using machine learning models for automatic decision-makers to distinguish healthy subjects from COVID-19 affected patients, on HRV parameters monitored non invasively by PPG.

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