

Cardiovascular evaluation with exercise testing using face mask during the COVID-19 pandemic

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Funding Acknowledgement: Type of funding sources: None.

Background: The COVID-19 pandemic is associated with more than 127 million of infected people and 2.7 million deaths in the world. However, cardiovascular diseases are still a worldwide main health problem. Patients are afraid to go to the hospital because of the risk of being infected with SARS-COV2. In particular, exercise testing (ET) has been underused, due to the fear of the airborne aerosol generation. There are cardiology centers performing ET that ask patient to wear a mask, although its consequences are not yet well known and there is only preliminary information of its use in patients with heart disease.

Purpose: Our objective was to evaluate the ergometric behavior of patients that performed an ET wearing a mask during the COVID-19 pandemic (COVID-G) and compare them with patients in the pre-pandemic period.

Methods: A cohort of patients who underwent an ET from march to december 2020 was compared with patients that performed an ET between march and december 2019. Because of COVID-19 preventive restrictions, we used a larger and highly ventilated room to perform ET. The antiseptis protocol was performed (room and equipment) and healthcare crew always wore high efficiency masks and ocular protection. All patients studied in 2020, must had succeeded a biological triage, and wore a mask throughout the ET. Variables are presented as frequency (percentage), mean (standard deviation) or median (interquartile interval) according to variable-type and distribution. Chi-square test, Student's t test or the Wilcoxon rank test

were used as appropriate. All p values less than 0.05 were considered stochastically significant.

Results: A total of 361 stress tests were studied, where 209 (58%) belonged to pre-pandemic group and 152 (42%) to COVID-G. Eighty-one percent were male, the mean age was 46±20 years and the most prevalent diagnosis was coronary heart disease (61%). There were no statistically differences between groups according to demographic variables. No mayor adverse outcome occurred during ET. The most common reason of exercise suspension in COVID-G was dyspnea compared to pre-pandemic studies: 117 (77%) vs 8 (4%), OR= 6.3 (95% CI, 4.6 to 8.6, p<0.001). Heart rate behavior along ET did not show significant differences between groups. Nevertheless, blood pressure levels were significantly higher in COVID-G patients than those in pre-pandemic group. Exertional blood pressure index was higher in the COVID-G (1.31±0.24 vs 1.26±0.2, p<0.05) than the pre-pandemic group. On the other side, maximal exercise tolerance (METs) did not show significant differences between groups (p=ns).

Conclusions: Exercise testing can be safely performed in patients with cardiovascular disease while wearing masks. In the COVID period, a significantly lower number of ET was performed. In addition, ET performance with mask was associated with higher values of systolic blood pressure and an increased number of tests suspended due to dyspnea.

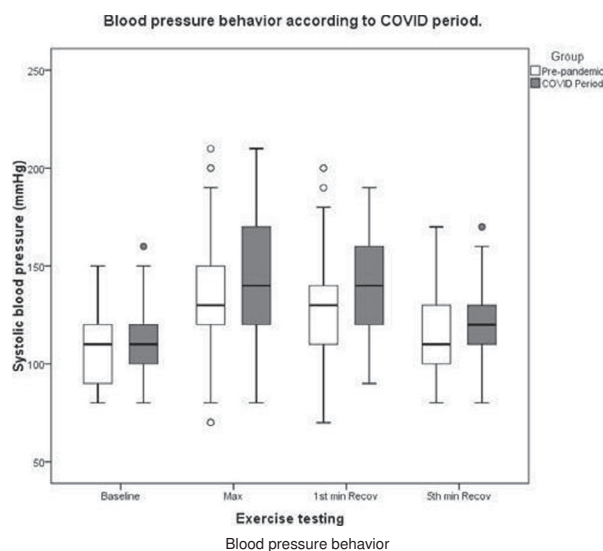


Table 2. Comparison of the ergometric performance between Pre-COVID and COVID-G patients.

| Variables | All | Pre-COVID | COVID-G | p value |
|---|------------|------------|------------|---------|
| n | 361 (100%) | 209 (58%) | 152 (42%) | |
| Rest HR (bpm) | 72 ± 15 | 72 ± 15 | 73 ± 15 | ns |
| Rest SBP (mmHg) | 108 ± 16 | 107 ± 17 | 111 ± 15 | < 0.01 |
| Rest DBP (mmHg) | 71 ± 11 | 69 ± 9 | 72 ± 12 | < 0.05 |
| Rest DP | 7.8 ± 1.9 | 7.6 ± 1.9 | 8.1 ± 1.9 | < 0.05 |
| Max HR (bpm) | 136 ± 31 | 136 ± 29 | 137 ± 33 | ns |
| Max SBP (mmHg) | 138 ± 27 | 133 ± 27 | 145 ± 27 | < 0.001 |
| Max DBP (mmHg) | 78 ± 10 | 77 ± 11 | 78 ± 10 | ns |
| Max DP | 19.3 ± 7 | 18.5 ± 6.5 | 20.4 ± 7.9 | < 0.05 |
| Ischemia (n, %) | 19 (5.3) | 18 (8.6) | 1 (0.7) | |
| Duke Score | 8 ± 5 | 7.9 ± 4 | 8.5 ± 5.3 | ns |
| Max HR (%) | 79 ± 14 | 81 ± 14 | 78 ± 12 | < 0.05 |
| METs-Max | 9.4 ± 4 | 9.2 ± 4 | 9.6 ± 4 | ns |
| MVO ₂ max (mlO ₂ /100g) | 20.7 ± 10 | 19.6 ± 9 | 22.2 ± 11 | < 0.05 |

Abbreviations. Heart Rate (HR), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), double product (DP), maximal oxygen uptake (VO₂max), maximal myocardial oxygen uptake (MVO₂max), Chronotropic Index (CI).

Ergometric performance