Medical Xpress

Severe COVID-19 survivors may show increased vascular risk associated with stress

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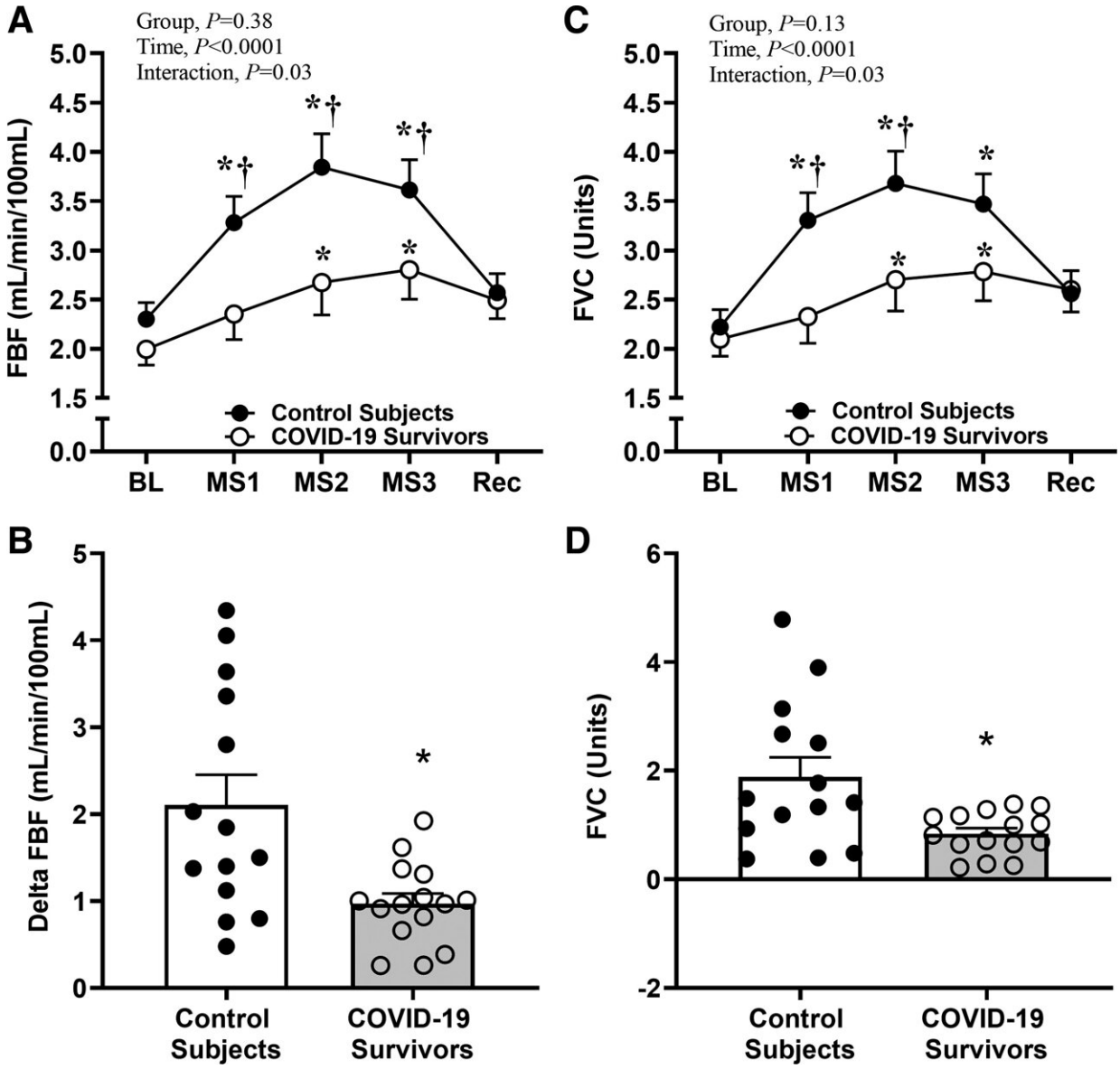

Vascular responses to mental stress in COVID-19 survivors. Forearm blood flow

(FBF) during mental stress (MS) in control subjects and in severe COVID-19 survivors (A); delta FBF (B); forearm vascular conductance (FVC) (C); and delta FVC (D). BL, baseline; Rec, recovery. *P American Journal of Physiology-Regulatory, Integrative and Comparative Physiology (2023). DOI: 10.1152/ajpregu.00111.2023

Recently published in the journal *American Journal of Physiology*, a Brazilian study demonstrated for the first time that survivors of severe COVID-19 infections may have elevated muscle sympathetic nerve activity (MSNA) in response to mental stress.

The study was carried out by the D'Or Institute for Research and Education (IDOR), in partnership with the University of São Paulo (USP), the Federal University of São Paulo (Unifesp), and the University of Colorado Boulder. Its results are a warning for the so-called long COVID, chronic sequelae left by the disease that could increase the risk of cardiovascular diseases.

Although many patients recover completely from the disease, previous studies led by the same scientists noted cardiovascular sequelae in patients that survived severe COVID-19 infections.

The research concluded that this population presents increased risk factors for cardiovascular complications, such as excessive muscle sympathetic nerve activity (MSNA), which has the acceleration of the heartbeat as one of its duties, in addition to other problems, such as greater stiffness in the main artery of the human body and dysfunctions in peripheral blood vessels, which are responsible for regulating blood flow and blood pressure.

These results encouraged the team to deepen the research and understand

the reaction of these patients to exposure to stress and physical activity, matters that also interfere with cardiovascular health.

The current publication analyzed 15 patients who had survived severe COVID-19 hospitalizations, in ICUs or wards, with a confirmed RT-PCR diagnosis and oxygenation levels equivalent to or lower than 93%. As a control group, 15 volunteers who had never had the disease, had no comorbidities, and were of similar age and body mass index (BMI) were chosen. The research was developed between September 2020 and October 2021, at a time when the dominant variants were beta and gamma, and none of the participants had been vaccinated.

To measure the effects of stress, patients and the control group were exposed to a 3-minute activity in which slides were projected in front of them and the image changed every 2 seconds, accompanied by conflicting sounds that were delivered through headphones. At the end of the analysis, it was concluded that all participants noticed a similar increase in the level of stress, but that in patients who had COVID-19, some physiological reactions were discrepant.

The authors mention that the ANSM of these survivors is already around 65% higher than that of those who did not have the disease. However, during the stress exposure activity, the increase in ANSM in patients who had COVID-19 was 128% greater than in the control group.

The authors also measured vascular responses to this stress induction and analyzed blood flow, vascular function, and mean arterial pressure across each participant's forearm. The analysis showed that the first two aspects were attenuated in COVID-19 patients, being more than 100% lower when compared to the control group, while mean arterial pressure was similar in all individuals.

The other test carried out by the study sought to analyze the same

markers during muscle stimuli in the participants, an activity that was performed through the voluntary contraction of the hands, in a manual prehension movement (act of squeezing). In this case, the observed results were different: ANSM, blood flow, and vascular function were similar between the groups, suggesting that the blood flow control mechanisms in the vascular system remain preserved in COVID-19 survivors.

The only discrepancy between the groups in the handgrip test was related to mean arterial pressure, which was reduced in patients with COVID-19, an aspect that the authors believe to be related to the previously observed blood vessel dysfunctions in the group.

However, the scientists point out that, even if the neurovascular response has not shown relevant changes between the groups in strength exercise, other evaluations with aerobic exercises would add interesting observations related to physical activity and patients who have overcome COVID-19.

This study was the first to prove that some COVID-19 survivors have an exaggerated ANSM in response to mental stress, as well as an attenuated vasodilation reaction compared to individuals who did not have the disease. This finding demonstrates a warning regarding the increased risk for cardiovascular diseases, and that patients who survived severe COVID-19 should remain attentive to routine exams and health care, even after the apparent overcoming of the infection.

More information: Diego Faria et al, Neurovascular and hemodynamic responses to mental stress and exercise in severe COVID-19 survivors, *American Journal of Physiology-Regulatory, Integrative and Comparative Physiology* (2023). DOI: 10.1152/ajpregu.00111.2023

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