this association is controversial due to limitations of the studies reviewed, with some not treating stroke as the primary endpoint or not reporting stroke aetiology.[10]

We also concur that aetiological study is essential in cases of stroke, and that ruling out the presence of PFO may be important from an aetiopathological viewpoint. When PFO is detected, we must first consider whether or not it is related to stroke; the Risk of Paradoxical Embolism (RoPE) score may be used for this purpose. Secondly, we must assess whether PFO closure is indicated, taking into account such factors as age, magnitude of the shunt, and/or presence of atrial septal aneurysm.[11] However, in patients with COVID-19, who often present comorbidities and who may present severe acute respiratory failure, we must consider the risk-benefit balance of an intervention that is not free of potential complications.[9] Therefore, we agree on the need for aetiological study of ischaemic stroke in patients with COVID-19 and that PFO may be a causal factor. However, this association must be analysed in prospective studies, and identifying PFO in these patients is unlikely to influence acute management in most cases.

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https://doi.org/10.1016/j.nrleng.2021.04.001
2173-5808/

Reply

Réplica

COVID-19 related strokes

Dear Editor:

In the letter to editor with title ''COVID related strokes: Pandora's Box may open as the p(c)lot thickens'', to the COVID-19-specific stroke etiologies that have been hypothesized (prothrombotic state, cardiomyopathy, endothelial damage, sepsis with hypothension), another one is added: pulmonary hypertension that would cause or increase a right-to-left shunt through an until then incidental patent formamen ovale (PFO). Chronic pulmonary hypertension increases the risk of stroke[1] but COVID-19-associated pulmonary hypertension is usually transient and there is debate about an increased risk of stroke with larger PFO or bigger right-to-left shunts.[2,3] Additionally to paradoxical embolism, pulmonary hypertension is associated to atrial fibrilation and polycithemia, which need different treatments to reduce their stroke risk. We have yet few data about the increase in stroke risk that the proposed mechanism — or other related to COVID 19 — will add. Until it is clarified we should be vigilant and include an echocardiogram in the study of COVID-19-related strokes, not only due to PFO and pulmonary hypertension but to COVID-19-associated cardiomiopathy.[4]

Funding

This research has not received specific support from public sector, commercial or non-profit agencies.

Conflict of interest

None declared.

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https://doi.org/10.1016/j.nrl.2021.04.003

0213-4853/

Neuropsychological rehabilitation program for patients with post-COVID-19 syndrome: a clinical experience☆

Programa de rehabilitación neuropsicológica en pacientes con síndrome post-COVID-19: una experiencia clínica

Dear Editor:

Most patients with SARS-CoV-2 infection recover within days or weeks. However, symptoms persist in some 10% of patients.[1] Post—COVID-19 syndrome, as it has been called, is a series of symptoms that appear during or after SARS-CoV-2 infection, persist for longer than 12 weeks, and cannot be explained by other causes. It usually presents as a combination of symptoms that frequently overlap and may fluctuate and change over time, affecting multiple systems.[2]

Patients with post—COVID-19 syndrome may present memory and concentration problems, brain fog, anxiety, and mood disorders.[3] These alterations have a negative impact on the patient's performance in family, social, or work settings. Neuropsychological rehabilitation may help these patients to recover brain function, improve functional capacity, and increase emotional well-being.

In June 2020, Institut Guttmann started an 8-week outpatient neurorehabilitation programme for patients with post—COVID-19 syndrome. The programme includes respiratory therapy, physical therapy, and neuropsychological rehabilitation (mood intervention, compensatory strategies, and cognitive therapy). Patients received cognitive therapy at home, using the Guttmann NeuroPersonalTrainer® platform (5 sessions/week of one-hour duration). The programme's planning assistant designed the intervention based on pre-treatment assessment results,[4] selecting the tasks to be completed during each session and adjusting the difficulty through a combination of parameters (number of stimuli, type of stimulus, speed of presentation, task duration, etc). The platform's task plan addresses several cognitive domains (attention, memory, executive function, and language, among others).

We present the results from 50 patients with no history of neurological disease who completed our neuropsychological rehabilitation programme between June 2020 and January 2021.

Mean age (SD) was 53.3 (12.78) years (range, 26-76). Women accounted for 54% (n = 27) of the total. Level of education was low (≤8 years of formal schooling) in 9 patients, average (9-12 years) in 14, and high (≥13 years) in 27. The mean time elapsed between the first positive PCR test and inclusion in the neurorehabilitation programme was 24.18 weeks (SD: 7.91; range, 12-37). A total of 31 patients (62%) were admitted to hospital (either to the intensive care unit or to other wards). Significant differences were observed between hospitalised and non-hospitalised patients in sex ($P < .001$) and age ($P = .001$). Men accounted for 67.7% of hospitalised patients (n = 21), whereas 89.5% (n = 17) of non-hospitalised patients were women. Non-hospitalised patients were younger (mean [SD] of 45.6 years [10.2], vs 58 [11.9] years in hospitalised patients).

Patients were administered a short assessment test battery before and after completion of the neuropsychological rehabilitation programme, including the following tests: forward and backward digit span, Rey Auditory Verbal Learning Test (RAVLT; learning, recall, and recognition), a formal phonemic fluency task (PMR), and the Hospital Anxiety and Depression Scale (HADS). Pre- and post-treatment results were compared with the Wilcoxon test for related samples ($\alpha < .05$). Effect size was calculated with the Pearson correlation coefficient. Effect size was considered small for $r \approx 0.10$, median for $r \approx 0.30$, and large for $r \approx 0.50$.[5]

☆ Please cite this article as: García-Molina A, Espiña-Bou M, Rodríguez-Rajo P, Sánchez-Carrión R, Enseñat-Cantallops A. Programa de reha-bilitación neuropsicológica en pacientes con síndrome post-COVID-19: una experiencia clínica. Neurología. 2021;36:565—566.