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Plasma biomarkers of neurodegeneration and neuroinflammation in hospitalized COVID-19 patients with and without new neurological symptoms

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Abstract

Background: The COVID-19 pandemic is an unprecedented global health care crisis. Older individuals and those with pre-existing AD/ADRD or mild cognitive impairment are at increased risk of SARS-CoV-2 infection, with a higher mortality. In this study we assessed that the presence of plasma biomarkers associated with AD, neurodegeneration and neuroinflamation in older patients (>60yrs old), who were hospitalized with COVID-19, who either had or did not have new neurological symptoms associated with infection.

Method: Patients were admitted to New York University Langone Health (NYULH), with sites in Manhattan, Brooklyn and Long Island. All patients were positive for SARS-CoV-2 infection. Plasma from 310 patients were analyzed (158 were tested positive for SARS-CoV-2 with neurological symptoms and 152 were positive for SARS-CoV-2 without neurologic symptoms). Plasma biomarkers assays (total tau [t-tau], neurofilament light [NfL], glial fibrillary acid protein [GFAP], ubiquitin carboxyl-terminal hydrolase L1 [UCH-L1] Aβ40, Aβ42 and pTau-181) were performed at the Biomarker Core of NYU ADRC using the SIMOA SR-X

Result: The levels of t-tau, NfL, GFAP, and UCH-L1 were measured using the Neurology 4-plex A and showed a significant elevation in COVID-19 patients with neurologic symptoms compared to COVID-19 patients without neurological symptoms: NfL (two tailed t-test $p = 0.0003$), GFAP (two tailed t-test $p = 0.0098$), UCH-L1 (two tailed t-test $p = 0.0138$) and t-tau (two tailed t-test $p = 0.04$). pTau 181 was also elevated in COVID-19 subjects with neurological symptoms (two tailed t-test $p = 0.0141$). There were no significant differences with $A\beta_{1\text{-}40}$ (two tailed t-test $p = 0.33$). Both $A\beta_{1\text{-}42}$ and the pTau/Aβ42 ratio showed a significant differences in patients with neurological symptoms (two tailed t-test $p = 0.049$ and $p = 0.0017$, respectively).

Conclusion: Serum biomarkers of neuronal injury, neuroinflammation and Alzheimer's disease such as NfL, t-tau, UCH-L1, GFAP and pTau-181 correlate strongly with the presence of neurological symptoms in COVID-19 patients. These findings indicate that patients who had COVID-19 may have an acceleration of AD/ADRD symptoms and pathology.