

CSF Biomarkers in Patients With COVID-19 and Neurologic Symptoms

A Case Series

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Study Question

Do hospitalized patients with SARS-CoV-2 infection and neurologic symptoms have evidence of CNS infection, inflammation, and injury in their CSF?

What Is Known and What This Paper Adds

Patients with COVID-19 commonly have neurologic symptoms, but the underlying mechanisms remain poorly understood. This investigation's analyses of CSF biomarkers suggest an unusual pattern of marked CSF inflammation in which soluble markers were increased but white cell response and other immunologic features typical of CNS viral infections were absent. The authors could not convincingly detect SARS-CoV-2 as the underlying driver of CNS inflammation.

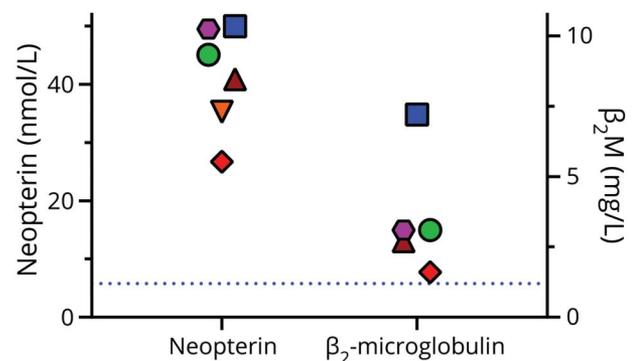
Methods

This is a case series of 6 patients with moderate-to-severe COVID-19 and neurologic manifestations (encephalopathy [n = 4], suspected meningitis [n = 1], and dysgeusia [n = 1]) who received treatment at the Sahlgrenska University Hospital in Gothenburg, Sweden, in March and April of 2020. These patients underwent diagnostic lumbar puncture. PCR analysis was used to confirm the presence of SARS-CoV-2 in nasopharyngeal swab samples and to test for SARS-CoV-2 in CSF samples and blood. Various assays were used to measure CSF biomarkers of intrathecal inflammation (i.e., white blood cell count, neopterin and β_2 -microglobulin level, and immunoglobulin G [IgG] index), blood-brain barrier integrity (albumin ratio), and axonal injury (neurofilament light chain protein [NfL] level).

Results and Study Limitations

Low levels of SARS-CoV-2 were detected in the CSF samples from 3 patients in 1 of 2 assays used, making direct

Figure Individual CSF Levels of Intrathecal Inflammation Biomarkers. The Dashed Line Indicates Reference Levels



CNS infection uncertain. All 6 patients had markedly elevated CSF levels of neopterin and β_2 -microglobulin but normal CSF IgG index values, CSF albumin ratios, and CSF white blood cell counts. Two patients had elevated CSF NfL levels. The present study's limitations include its small sample, the lack of a control group of patients without neurologic manifestations, and its focus on patients with moderate-to-severe COVID-19, which may limit generalizability to mild cases.

Study Funding and Competing Interests

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A draft of the short-form article was written by M. Dalefield, a writer with Editage, a division of Cactus Communications. The corresponding author(s) of the full-length article and the journal editors edited and approved the final version.

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