Int. j. adv. multidisc. res. stud. 2022; 2(6):485-486

Received: 01-11-2022
Accepted: 11-11-2022

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Letter to the Editor

The spectrum of neuro-COVID is broader than is often propagated

[1] Josef Finsterer, [2] Fulvio A Scorza, [3] Antonio-Carlos G Almeida

[1] Neurology & Neurophysiology Center, Vienna, Austria

[2] Disciplina de Neurociência. Universidade Federal de São Paulo/Escola Paulista de Medicina (UNIFESP/EPM). São Paulo, Brasil

[3] Centro de Neurociências e Saúde da Mulher "Professor Geraldo Rodrigues de Lima." Escola Paulista de Medicina/Universidade Federal de São Paulo (EPM/UNIFESP). São Paulo, Brasil

Corresponding Author: **Josef Finsterer**

We read with interest the review article by Brola *et al*. about the neurological side effects of SARS-CoV-2 infections [1]. The authors included and discussed the most relevant neurological complications after an infection with SARS-CoV-2 which were reported in the literature [1]. It was concluded that neurological manifestations of SARS-CoV-2 infections can be the initial clinical manifestation of the disease, can even dominate the clinical presentation in the later disease courses, and can be the dominant abnormality in long-COVID syndrome [1]. The study is appealing but raises concerns that should be discussed.

The main imitation of the study is that a number of neurological complications of SARS-CoV-2 infections were not mentioned without explaining why not the entire spectrum of neurological SARS-CoV-2 associated disease was included [1]. Central nervous system (CNS) diseases that were not mentioned or discussed in the review include subarachnoid bleeding [2], opsoclonus myoclonus syndrome [3], acute, hemorrhagic, necrotising encephalopathy (AHNE) [4], acute, hemorrhagic, leucoencephalitis (AHLE) [5], reversible cerebral vasoconstriction syndrome (RCVS) [6], pituitary apoplexy [7], Tolosa-Hunt syndrome (THS) [8], cerebellitis, brainstem Bickerstaff encephalitis (BBE) [9], rhomb-encephalitis [10], limbic encephalitis elmoulhib [11], cerebral vasculitis [12], neuromyelitis optic spectrum (NMO) spectrum disorders [13], and microbleeds [14]. Peripheral nervous system (PNS) disorders following a SARS-CoV2 infection and not mentioned in the review are immune plexitis, also known as Parsonage Turner syndrome (PTS) [15], small fiber neuropathy [16], dermatomyositis [17], myositis [18], and rhabdomyolysis [19]. SARS-CoV-2 may not only deteriorate a pre-existing neurological condition, such as myasthenia or multiple sclerosis, but may also trigger new onset myasthenia or multiple sclerosis [20].

A further limitation is that the term "encephalopathy" was commonly used without providing a definition of this term. We should know whether the authors mean epilepsy, cognitive impairment, disorientation, or others with this term.

Missing is a discussion of SARS-CoV_2 associated immune, thrombotic thrombocytopenia (ITTP) as the cause of venous sinus thrombosis (VST). There is also no mentioning of cardiac involvement in a SARS-CoV-2 infection which can secondary cause embolic stroke due to thrombus formation in the atria, ventricles or peripheral veins in case of a foramen ovale.

Overall, the interesting study has limitations that call the results and their interpretation into question. Addressing these limitations could further strengthen and reinforce the statement of the study. A review about the neurological complications of SARS-CoV-2 infections should be compulsory and comprehensive to demonstrate the broad spectrum of complications and to guide clinicians on how to approach the diagnostic and therapeutic management of these complications.

Declarations

Funding sources: No funding was received.

Conflicts of interest: None.

Acknowledgement: None.

Ethics approval: Was in accordance with ethical guidelines. The study was approved by the institutional review board.

Consent to participate: Was obtained from the patient.

Consent for publication: Was obtained from the patient.

Availability of data: All data are available from the corresponding author.

Code availability: Not applicable.

Author contribution: JF: design, literature search, discussion, first draft, critical comments, final approval, FS and A-CA: literature search, discussion, critical comments, final approval.

Keywords: COVID-19, SARS-CoV-2, Stroke, Vasculitis, Neuro-Covid

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