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Images

Brutal neurological disorder after SARS-CoV-2 infection

Un trouble neurologique brutal après infection par le SARS-Cov-2

K. Chevalier^{a,*}, G. Poillon^b

^a Department of Neurology, Foundation Adolphe de Rothschild Hospital, Paris, France

^b Department of Neuroradiology, Foundation Adolphe de Rothschild Hospital, Paris, France



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1. The history

A 45 years-old man without past medical history was admitted in our stroke unit for a left hemiparesis and psychomotor retardation (significant slowing in movements and speech). Three days before he was diagnosed for SARS-CoV-2 infection. Onset brain MRI revealed a relatively well-circumscribed lesion centered by the splenium of the corpus callosum, extending laterally into the adjacent deep white matter, hyperintense on Fluid Attenuated Inversion Recovery (FLAIR) with restricted diffusion (Fig. 1). Symptoms progressively improved without any treatment. A 7-day follow-up MRI showed an almost total regression of the initial pattern (Fig. 1). After three months of follow-up the patient was free of any neurological symptoms.

2. The diagnosis

Cytotoxic lesions of the corpus callosum (CLOCCs) after a SARS-CoV-2 infection.

* Corresponding author at: Department of Neurology, Foundation Adolphe de Rothschild Hospital, 25-29, rue Manin, 75019 Paris, France.
E-mail address: kevinchevalier05@gmail.com (K. Chevalier).

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3. The comments

CLOCCs represent a nonspecific condition on brain MRI associated with reversible neurological signs [1]. It may be secondary to multiple causes: drug toxicity, seizures, malignancy, subarachnoid hemorrhage, metabolic disturbance, trauma and viral infection. Association between SARS-CoV-2 infection and CLOCCs syndrome has already been described before. In a retrospective French cohort of 73 patients with neurological symptoms and SARS-CoV-2 infection, 43 had a pathological MRI (58.9%) and 3 of them (4.1%) showed a restricted diffusion pattern within the corpus callosum consistent with CLOCCs [2]. A case of CLOCCs after SARS-CoV-2 mRNA vaccination has also been reported [3].

As described before, CLOCCs syndrome is associated with various situations that have in common the capacity to induce edema in corpus callosum through inflammation and/or extracellular glutamate level disturbance. Indeed, under certain circumstances described before, monocytes/macrophages can release inflammatory cytokines as interleukin 1 (IL-1) and 6 (IL-6) leading to the recruitment of T cells which affect the endothelial cells. This cascade leads to a weakening of the blood brain-barrier and the stimulation of astrocytes by IL-1 and TNF α which releases glutamate and block reuptake of glutamate, thus increasing

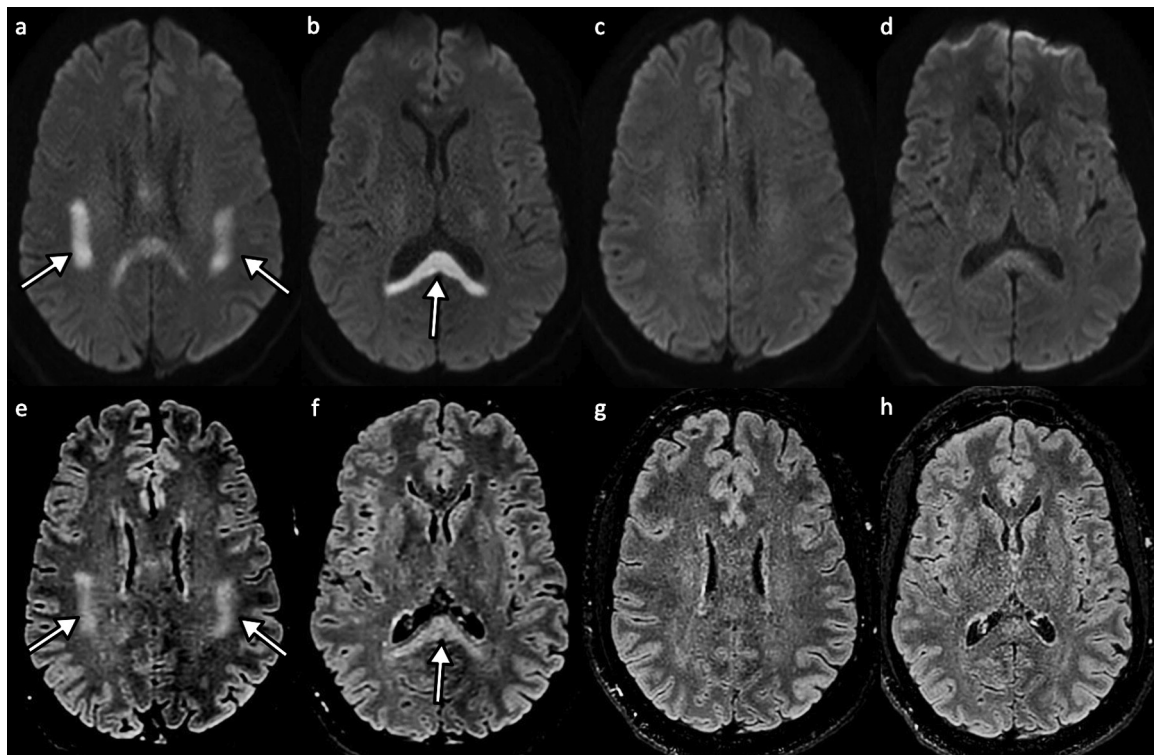


Fig. 1. Brain MRI: symmetric hyperintense lesions at the diagnosis in diffusion-weighted imaging (a, b) and FLAIR, centered by the splenium of the corpus callosum (f) and extending laterally into the adjacent deep white matter (arrows) (e), seven-day follow-up brain MRI showed an almost total regression of the initial pattern (c, d, g, h).

its extracellular level [4]. The action of glutamate on different receptors (N-methyl-D-aspartate receptors, α -amino-3-hydroxy-5-methyl-4-isoxazole propionic acid receptor), sodium-potassium pumps, and aquaporins leads to an influx of free water into neurons causing cytotoxic edema. Predominance of the lesion in the corpus callosum is secondary to its vulnerability to cytokinopathy. The density of receptors previously mentioned in neurons, astrocytes, and oligodendrocytes in the corpus callosum is higher than in other brain areas.

The clinical symptoms associated with CLOCCs are nonspecific and diverse. General clinical symptoms include fever, headache, vomiting and diarrhea. Neurological symptoms include a wide range of disorders: cognitive impairment, delirium, confusion, coma, seizure, drowsiness, acute urinary retention, motor and/or sensitive deficit, slurred speech, tremor, vertigo. The hallmark of CLOCCs is the disappearance of these symptoms with complete recovery within a month [5]. On brain MRI, CLOCCs typically demonstrate a hypersignal FLAIR and decreased signal intensity in T1-weighted images with restricted diffusion. Three patterns are commonly observed:

- a round or oval lesion located in the center of the splenium;
- a lesion in the center of the splenium but with lateral extension into the adjacent white matter or;
- a posterior lesion with extension into the anterior portion of the corpus callosum [1].

CLOCCs is therefore one of the causes of neurological disorder in patient infected by SARS-CoV-2. Brain MRI is essential for the

diagnosis. On the other hand, a typical image of CLOCCs on brain MRI should lead to the search of SARS-CoV-2 infection especially during the pandemic. Prognosis is generally favorable without any specific treatment apart from the cause.

Disclosure of interest

The authors declare that they have no competing interest.

Credit author statement

Kevin Chevalier wrote the manuscript.

Guillaume Poillon provide the MRI pictures and their interpretation.

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