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COVID-19

Alexia without agraphia in a post COVID-19 patient with left-hemisphere ischemic stroke

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Dear Editor,

SARS-CoV-2, resulting in COVID-19, can cause cognitive dysfunction. Patients with SARS-CoV-2, for instance, can be affected by executive and mnestic difficulties [1]. Furthermore, some patients with SARS-CoV-2 and ischemic stroke can present with more focal and isolated cognitive dysfunctions. Priftis et al. [2] reported a patient (i.e. LA) who showed agraphia without alexia (pure agraphia), together with some signs of conduction aphasia. By contrast, LA's other cognitive functions were largely preserved.

Another focal neuropsychological disorder is alexia without agraphia (pure alexia) [3]. This disorder is usually caused by posterior left-hemisphere lesions involving the occipito-temporal cortex and the splenium of the corpus callosum. As the term denotes, patients affected by alexia without agraphia are unable to read. Nevertheless, they remain able to write, even if they cannot read what they have written. Here, we reported on LM, a patient initially affected by SARS-CoV-2, who showed alexia without agraphia in the presence of a largely preserved general cognitive profile.

LM was a 72-year-old, right-handed male, with 16 years of education. On October 4th, 2020, he reported an episode of fever with respiratory signs. Thereafter, he resulted positive on a molecular diagnostic test for SARS-CoV-2. On October 9th, after 5 days in home isolation, with fever and respiratory signs, the patient was admitted to the Infectious Disease Department of Treviso Hospital Ca' Foncello. A nasopharyngeal swab performed on October 14th was still positive. Chest CT scans showed interstitial pneumonia. Because his respiratory sings were worsened, on October 19, 2020, LM was transferred to the Pulmonary Disease Department of the same hospital. New molecular diagnostic tests for SARS-CoV-2, performed on October 28th and 30th, were negative.

On October 31st, 2020, LM complained of visual deficits within his right visual hemifield. Furthermore, he could no longer distinguish the letters of the alphabet or read single words and sentences. A comprehensive neurologic examination (November 5th, 2020) revealed the presence of a complete, right homonymous hemianopia and a mild deficit of the VII cranial nerve. All other sensorimotor functions were intact.

On November 10th, 2020, LM was admitted to the First General Medicine Department of Treviso Hospital. He was alert and fully oriented to time and space. He still showed signs of right homonymous hemianopia with macular sparing. FLAIR MRI performed on November 11th, 2020, revealed the presence of a left occipito-temporal ischemic stroke extending to the underneath white matter (Fig. 1). DTI documented an incomplete lesion to the splenium of the corpus callosum.

Comprehensive neuropsychological assessment was performed to investigate intact and impaired cognitive functions. LM's overall cognitive status was preserved for his age and education (see Table 1; Montreal Cognitive Assessment: MoCA [4]; https://mfr.osf.io/render?url=https%3A%2F%2Fosf.io%2Fbwge6%2Fdownload), even if he was unable to retrieve five common nouns after a short delay. Nonetheless, LM did not show signs of amnesia in everyday life activities. For instance, he was perfectly able to learn and recall the names of the clinicians and his scheduled activities.

LM performance was largely preserved on number processing tasks, except for transcoding written number words into Arabic digits. His ability to perform additions, subtractions, and multiplications was intact (Table 2 [5]; https://mfr.

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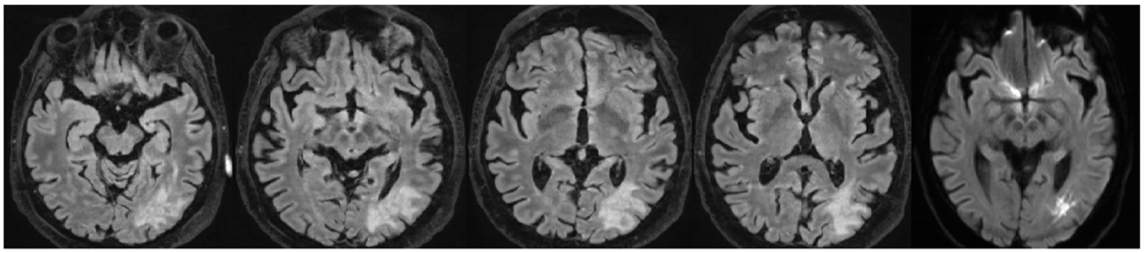

Fig. 1 RM Flair scan showing an occipito-temporal hyperintense lesion extending to the white matter

osf.io/render?url=https%3A%2F%2Fosf.io%2Fbwge6%2Fdownload).

LM oral language abilities were highly preserved in everyday life. He was perfectly able to repeat aloud spoken words, non-words, and sentences. Thus, LM had intact phonemic perception, phonological short-term memory, and articulation. His oral comprehension was very mildly impaired for single words, but it was perfect for sentences. LM's prosody was intact, and agrammatism was absent. Furthermore, he was good at naming colours. Finally, his oral fluency was intact for letters F and A but impaired for letter S and the animal category (Table 2 [5]).

LM was perfectly able to write on dictation both single letters and sentences. By contrast, his reading skills were severely impaired (correct: 1/10 words, 0/5 non-words, and 0/2 sentences). His written comprehension was also impaired. Because LM was impaired in reading both words and non-words, his deficit should be localized at a processing level before the input orthographic lexicon and the grapheme-to-phoneme conversion mechanism (e.g. graphemic analysis mechanisms).

Another point in favour of a peripheral impairment at the level of graphemic analysis was LM's inability to transcode written number words into Arabic digits. Note that this task requires only graphemic analysis given that transcoding a written number word to the respective Arabic digit does not require reading aloud the written number word. LM's difficulties in reading cannot be attributed to his hemianopia, because he was free to move his eyes, and there was no time limit to perform the tasks. Furthermore, LM's perfect ability to read aloud Arabic digits and to name colours ruled out the presence of peripheral visual impairment. Finally, LM was able to read correctly through the tactile modality, by using 3D letters.

LM showed alexia without agraphia (pure alexia), whereas the rest of his cognitive profile remained largely preserved. This pattern mirrors that reported by Priftis et al. (2020), who described LA, a patient with agraphia without alexia (pure agraphia). Thus, patients affected by COVID-19 and stroke can show highly isolated and focal cognitive deficits in the domain of written language. To the best of our knowledge, LA and LM are the first two cases with pure alexia or pure agraphia reported in patients affected by SARS-CoV-2.

Whether ischemic lesions reported in patients LM and LA were caused by SARS-CoV-2 remains an open question [6]. Nonetheless, the excellent medical history of LA and the overall good health status of LM render plausible the association between SARS-CoV-2 and ischemic stroke. Furthermore, it has been recently reported that the risk of ischemic stroke was double that observed in patients with SARS-CoV-1 or severe sepsis. In addition, the risk of ischemic stroke was eight times higher than that of patients with influenza [7]. Furthermore, other findings have suggested that ischemic strokes in patients with SARS-CoV-2 are more severe and disabling than those in non-SARS-CoV-2 patients [8].

Note that neuropsychological disorders can be present even when SARS-CoV-2 is not active anymore. Indeed, LM resulted negative 3 days before the onset of his stroke. Nevertheless, his neuropsychological disorders appeared after virus neutralization and lasted for months. Thus, comprehensive neuropsychological assessment and rehabilitation should become the default choice for all patients showing cognitive dysfunction during or after SARS-CoV-2 infection [9, 10].

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Declarations

Informed consent The patient gave his informed consent to participate to the study. The study was conducted according to the principles of the Declaration of Helsinki.

Conflict of Interest None

Ethical approval None

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