



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

Bilateral posterior cerebral artery territory infarction in a SARS-Cov-2 infected patient: discussion about an unusual case

Claire Bonardel, MD,^{*1} Mathieu Bonnerot, MD,^{†2} Marie Ludwig, MD,^{*3}
Wilfried Vadot, MD,^{†4} Gaspard Beaune, MD,^{‡5} Bruno Chanzy, MD,^{‡6}
Lucie Cornut, MD,^{*7} H el ene Baysson,^{§8} Magali Farines,^{§9}
Isabelle Combes,^{§10} Gabriel Macheda, MD,^{¶11} and Fabrice Bing, MD, PhD^{*}

In time of SARS-Cov2 pandemic, neurologists need to be vigilant for cerebrovascular complications of Covid-19. We present a case of bilateral occipito-temporal infarction revealed by a sudden cortical blindness with haemorrhagic transformation after intravenous thrombolysis in a diabetic patient infected by Covid-19. Differential diagnoses are discussed in front of this unusual presentation and evolution.

Keywords: Infarction—MR perfusion—COVID-19—Visual loss—SARS-Cov2

  2020 Elsevier Inc. All rights reserved.

Case presentation

A 51-year-old-man presented with one-week history of cough, dysgeusia and diarrhea. The patient complained of moderate headache without fever. The patient had a history of diabetes mellitus, hypertension and obesity. Blood investigation showed a lymphocytopenia (1.08 giga/L), an

increased fibrinogen (5.1 g/L), ferritin (1190 μ g/l), creatin-kinase (749 UI/L), C-reactive protein (71 g/L), ASAT (54 UI/L) and glycated hemoglobin (9.1%) concentrations. Prothrombin Ratio was low (66%). Antiphospholipid, platelets and partial thromboplastin time were normal. The RT-PCR for SARS-Cov-2 using a nasopharyngeal swab was positive. A chest scan showed bilateral ground glass opacities concerning more than 50% of the parenchymal lung (Fig. 1). Six days after arrival and 30 min after the fourth injection of remdesivir (loading dose: 200 mg IV, 100 mg IV per day thereafter), he presented an abrupt cortical blindness and disorientation (NIHSS score: 4). An atrial fibrillation (AF) was recorded. A first brain MRI performed one hour after clinical onset showed bilateral and asymmetric acute occipito-temporal infarction without visibility of the P3 segments of the posterior cerebral arteries (PCA) (Fig. 2A to C). Fluid-attenuated inversion recovery (FLAIR), T2*, MR venography and MR angiography of the supra-aortic trunks were normal. No pathological enhancement in leptomeningeal spaces was observed. Alteplase was injected 128 min after symptom onset. The following morning, blindness was unchanged and anterograde memory disorders with anosognosia were noticed. The 24 h control multimodality MRI showed a haemorrhagic transformation of the previous lesions (Fig. 2E-F). Dynamic susceptibility-weighted contrast-enhanced magnetic resonance perfusion imaging (DSC-MRI perfusion) showed an increase of cerebral blood

From the ^{*}Imaging Unit, Anancy Hospital, Metz-Tessy, France; [†]Neurology Unit, Anancy Hospital; [‡]Biology Department, Anancy Hospital; [§]Delegation to Clinical Research and Innovation, Anancy Hospital; and [¶]Infectiology Unit, Anancy Hospital.

Received June 11, 2020; revision received June 16, 2020; accepted June 25, 2020.

Corresponding author: Fabrice Bing, Imaging Unit, Anancy Hospital, 74374 Metz-Tessy, France. Phone: +33 450637007 E-mail:

fabricebing@yahoo.fr.

¹Claire Bonardel: +33 450636363

²Mathieu Bonnerot: +33 450636363

³Marie Ludwig: +33 450636363

⁴Wilfried Vadot: +33 450636363

⁵Gaspard Beaune: +33 450636363

⁶Bruno Chanzy: +33 450636363

⁷Lucie Cornut: +33 450636363

⁸H el ene Baysson: +33 450636363

⁹Magali Farines: +33 450636363

¹⁰Isabelle Combes: +33 450636363

¹¹Gabriel Macheda: +33 450636363

1052-3057/\$ - see front matter

  2020 Elsevier Inc. All rights reserved.

<https://doi.org/10.1016/j.jstrokecerebrovasdis.2020.105095>

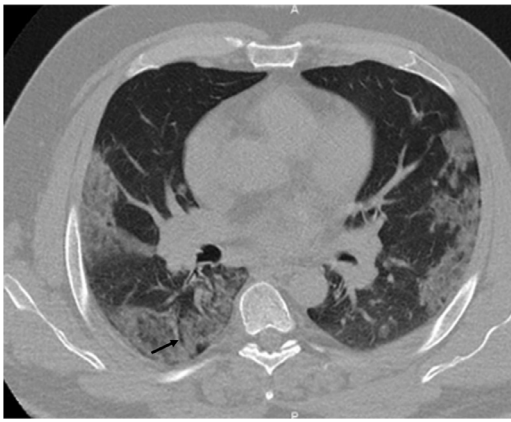


Fig. 1. Axial CT scanner shows focal subpleural ground-glass opacities in the left and right lobes. The right lower lobe lesion is accompanied by air bronchogram (arrow).

volume (CBV) and flow (CBF) in the right thalamus and an increase of the mean transit time (MTT) and CBV in the right hemisphere (Fig. 1H). Distal segments of the PCA were permeable (Fig. 2D). Nine hours later, the patient died due to a rapid respiratory breakdown, without neurological worsening.

Discussion

This bilateral cerebral posterior stroke may be secondary to an embolic event (AF). Stroke could also be explained by the state of hypercoagulability induced by SARS-Cov-2 infection¹. Severe patients are more likely to have neurologic symptoms² and bilateral frontotemporal hypoperfusion³ has been reported. In our case, MTT and

CBV were increased in the right hemisphere which may reflect reduced cerebral perfusion pressure. The increase value of the CBF in the right thalamus may correspond to a post-recanalization hyperperfusion⁴.

Other stroke mechanisms can be suggested. Infection may have induced cerebral vasculitis, explaining the stroke and the perfusion's anomalies. Severe reversible cerebral vasoconstriction syndrome (RCVS) cases with cerebral infarction and intracranial haemorrhage have been reported but the absence of thunderclap headache is unusual in RCVS⁵. The absence of rapid increase in blood pressure and the presence of an initial cytotoxic oedema instead of vasogenic is less in favour of Posterior Reversible Encephalopathy Syndrome (PRES)⁶. An adverse effect of remdesivir is also to be discussed, but no neurological adverse effect potentially related to remdesivir have been reported⁷. Finally, the absence of thalamus involvement makes the diagnosis of acute necrotizing encephalitis unlikely⁸.

In conclusion, the origin of the stroke is probably multifactorial: the cytokine storm syndrome and hypercoagulability may have induced blood flow dysregulation, associated with an embolic event that may finally induce arterial thrombosis. A cerebral artery vasculitis or a RCVS are not excluded. This unusual case confirms the increased risk of thrombotic events in SARS-Cov2 infected patients.

Declaration of Competing Interest

The authors report no disclosures. Informed consent for publication has been signed by the wife of the patient.

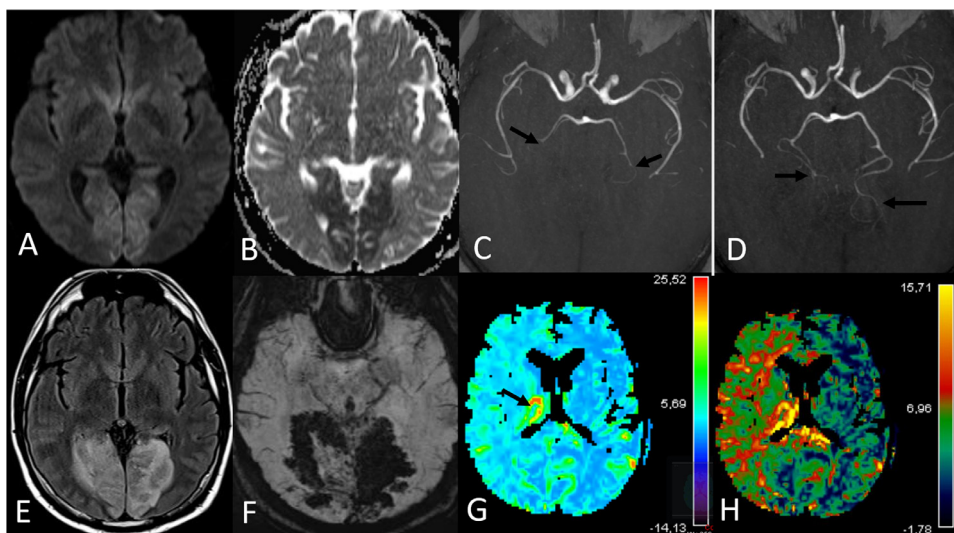


Fig. 2. First MRI (A to C). Diffusion-Weighted MRI (DWI) shows a high signal on b 1000 (A) with low Apparent Diffusion Coefficient (ADC) in the occipital lobes (B). Time of Flight (TOF) (C) shows P3 segments of posterior cerebral arteries (PCA) bilateral occlusion (arrows) (C). Second MRI (D to F). TOF shows better visualisation of distal segments of bilateral PCA (arrows) (D). Fluid-attenuated inversion recovery (FLAIR) shows a hypersignal in the initial ischemic lesions (initial FLAIR was normal) (E). Susceptibility-Weighted imaging (SWI) shows hypo-intensity (haemorrhage) concerning the totality of the ischemic lesion (F). MRI perfusion shows an increase cerebral blood volume (CBV) in the right thalamus (arrow) (G) and an increase of MTT in the right hemisphere (H).

References

1. Yin S, Huang M, Li D, Tang N. Difference of coagulation features between severe pneumonia induced by SARS-CoV2 and non-SARS-CoV2. *J Thromb Thrombolysis*. Epub 2020 Apr 3.
2. Mao L, Jin H, Wang M, et al. Neurologic Manifestations of Hospitalized Patients With Coronavirus Disease 2019 in Wuhan, China. *JAMA Neurol* Epub 2020 Apr 10.
3. Helms J, Kremer S, Merdji H, et al. Neurologic Features in Severe SARS-CoV-2 Infection. *N Engl J Med*. Epub 2020 Apr 15.
4. Kidwell CS, Saver JL, Mattiello J, et al. Diffusion-perfusion MRI characterization of post-recanalization hyperperfusion in humans. *Neurology* 2001;57:2015-2021.
5. Yamada H, Kikuchi R, Nakamura A, Miyazaki H. Severe reversible cerebral vasoconstriction syndrome with large posterior cerebral infarction. *J Stroke Cerebrovasc Dis* 2018;27:3043-3045.
6. Pilato F, Distefano M, Calandrelli R. Posterior reversible encephalopathy syndrome and reversible cerebral vasoconstriction syndrome: clinical and radiological considerations. *Front Neurol* 2020;11:34.
7. Mulangu S, Dodd LE, Davey RT, et al. A randomized, controlled trial of Ebola virus disease therapeutics. *N Engl J Med* 2019;381:2293-2303.
8. Poyiadji N, Shahin G, Noujaim D, Stone M, Patel S, Griffith B. COVID-19-associated acute hemorrhagic necrotizing encephalopathy: CT and MRI features. *radiology*. Epub 2020 Mar 31:201187.