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.

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Cerebral venous thrombosis associated with COVID-19 infection: Causality or coincidence?

Background

The full spectrum of COVID-19 infection remains uncertain. Some authors have reported neurologic manifestations such as leptomeningeal involvement, acute ischemic strokes or acute hemorrhagic necrotizing encephalopathy [1–3]. Others described a higher prevalence of acute pulmonary embolism in context of COVID-19 infection [4,5]. Here we report 2 cases of patients presenting with cerebral venous thrombosis associated with COVID-19 infection.

Case 1

A 62-year-old woman with history of morbid obesity presented with fever, cough and dyspnea. Nasal swabs were positive for COVID-19 on reverse transcriptase-polymerase chain reaction (RT-PCR) test. CT-scan demonstrated typical findings for COVID-19. Fifteen days after the onset of symptoms, she presented with headache and altered vision, rapidly followed by sudden right hemicorporeal deficit and altered consciousness. Laboratory results showed leukocytosis (20.22×10^9/L, normal $4.0–10.0 \times 10^9$/L), elevated liver enzymes (AST = 54 IU/L, normal < 32 IU/L; ALT = 68 IU/L, normal < 33 IU/L; GGT = 87 IU/L, normal 5–35 IU/L) and D-dimer elevation (14.2 mg/L, normal < 0.5 mg/L).

Non-contrast brain CT and MRI revealed large confluent intrapenchymal hemorrhage in the left fronto-temporal lobes. CT venogram showed cerebral venous thrombosis (CVT) of the left transverse sinus, straight vein, vein of Galen and internal cerebral veins (Fig. 1).

Case 2

A 54-year-old woman presented with fever, asthenia. She has a history of breast cancer in remission, initially treated by surgery, radiotherapy and for the past 5 years with hormone therapy without any complications reported. Despite initial symptomatic treatment, the patient rapidly worsened her condition, rapidly developing cough and then severe headache about 2 weeks after the onset of symptoms. Chest CT-scan revealed typical subpleural ill-defined ground glass opacities of COVID-19 infection. Laboratory results showed leukocytosis (18.32×10^9/L, normal $4.0–10.0 \times 10^9$/L), high level of CRP (170.8 mg/L, normal < 5 mg/L) and D-dimer elevation (2.36 mg/L, normal < 0.5 mg/L).

Non-contrast brain CT and MRI revealed large hemorrhagic infarction in the left temporal lobe. CT venogram and MR angiography showed cerebral venous thrombosis (CVT) of the left transverse sinus (Fig. 2).

Discussion

COVID-19 is a pandemic infection caused by severe acute respiratory syndrome coronavirus 2. When symptomatic, COVID-19 is known to typically present with systemic and respiratory manifestations [6,7]. COVID-19 can also cause hyperactivation of inflammatory factors and damage to the coagulation system causing D-dimer and platelet abnormalities. It increases the risk of abnormal blood clotting leading to deep vein thrombosis or pulmonary embolism [4–6]. Central nervous system symptoms or diseases have recently been reported [1,2,8]. However, these are the first reported cases of CVTs associated with COVID-19 infection.

As the number of patients diagnosed with COVID-19 increases worldwide, clinicians should be cautious when managing patients presenting with headache with or without other neurological symptoms, especially those who, like our patients, have known risk factors for venous thromboembolic disease [9]. These isolated results require further large studies to confirm a possible causal relationship between CVT and COVID-19 infection. Epidemiological studies evaluating the incidence of CVTs during the currently pandemic period as compared to previous years might support our findings. Nevertheless, our cases suggest that a careful examination of cerebral venous sinuses should be systematically performed in patients with COVID-19 infection to look for CVT. Similarly, patients presenting with acute CVT in the current epidemic setting should benefit from a simultaneous chest CT to confirm or rule out COVID-19. This approach might help improve managing and treating patients with CVTs associated with COVID-19. Our case also highlights the importance of prophylactic measures for avoiding thromboembolism.

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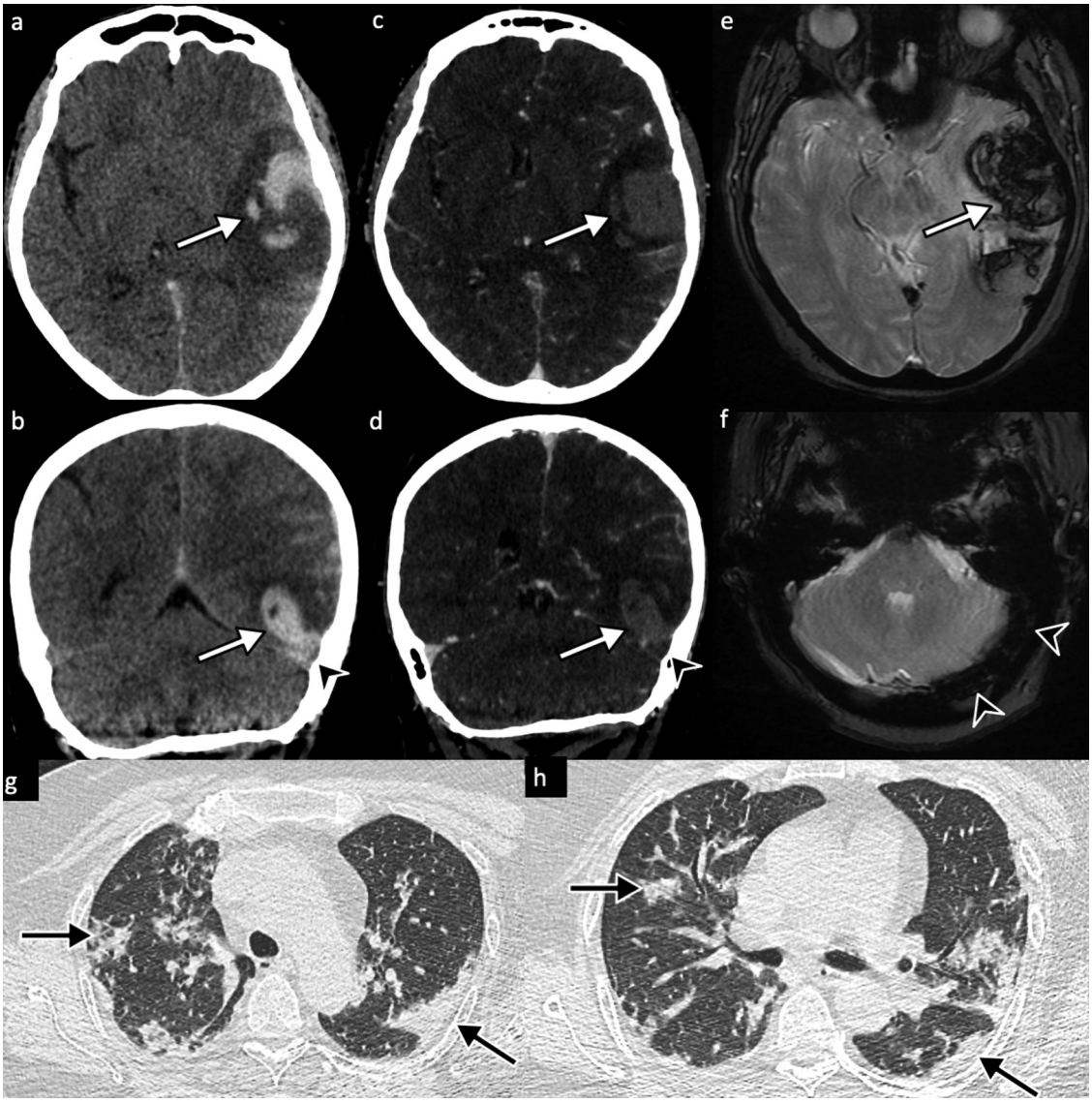

Fig. 1. Patient 1. Non-contrast brain CT (a, b) revealed large confluent hyperdensity of the left fronto-temporal lobes (white arrows), consistent with intrapenchymal hemorrhage, as well as hyperdense left transverse sinus (black arrowhead), suggestive of cerebral venous thrombosis (CVT). CT venogram (c, d) demonstrated filling defect in the left transverse sinus, confirming CVT. Susceptibility-weighted MRI (e,f) showed loss of signal of the left fronto-temporal lobes (white arrow) and left transverse sinus (black arrowheads), confirming intraparenchymal hemorrhage complicating CVT. CT-scan (g, h) demonstrated bilateral areas of peripheral ground glass opacities and consolidations (black arrows), highly suggestive of COVID-19.

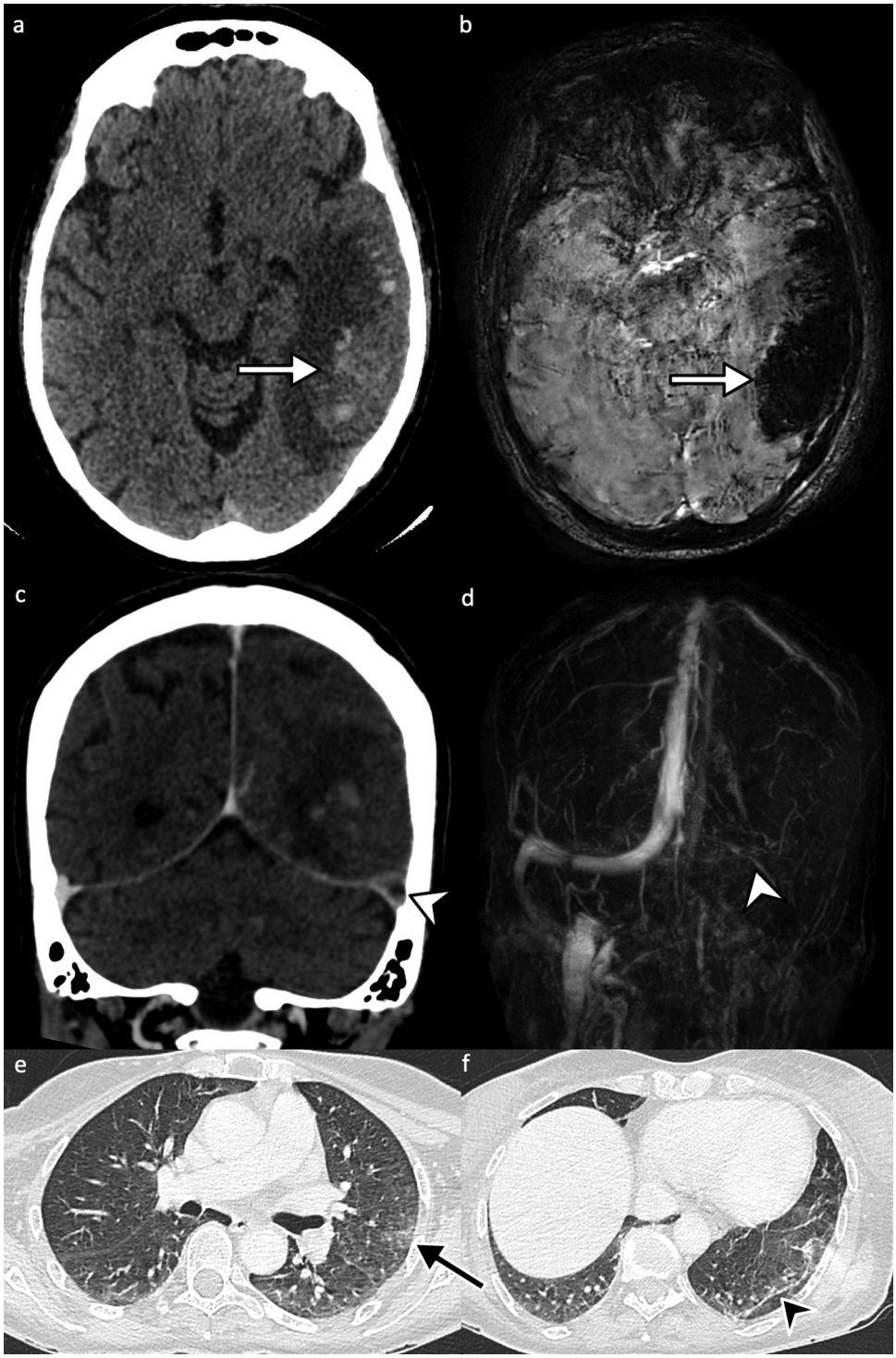

Fig. 2. Patient 2. Non-contrast brain CT (a) and brain susceptibility-weighted MRI (b) revealed large hemorrhagic infarction of the left temporal lobe (white arrows). CT venogram (c) and MR venography (d) demonstrated filling defect in the left transverse sinus (white arrowheads) confirming CVT. CT-scan demonstrated subpleural ill-defined ground-glass (black arrow) and linear opacities (black arrowhead), highly suggestive of COVID-19.

Disclosure of interest

The authors declare that they have no competing interest.

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