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### Letter to the Editor: "Coronavirus Disease 2019 (COVID-19) Can Cause Cerebral Rebleeding"



The most commonly described clinical features of coronavirus disease 2019 (COVID-19) have been related to overwhelming respiratory and neurologic symptoms that have been underestimated and under-reported.<sup>1,2</sup> Patients with COVID-19 may show a wide range of neurologic manifestations, such as loss of consciousness, headache, seizures, ageusia, hyposmia, and dysphagia.<sup>3</sup> Here, we report a case of COVID-19 causing rebleeding after brain surgery for a chronic subdural hematoma. We believe that cerebral hemorrhage may be caused by COVID-19.

An 85-year-old male patient with a history of hypertension stabilized on long-term dual antihypertensive therapy presented at the emergency department with consciousness disorders (Glasgow Coma Scale 13/15), headache, vomiting, and right hemiplegia without any preoperative respiratory symptoms. He reported a history of a mild head injury for 3 weeks. Computed tomography (CT) of the brain showed a chronic subdural hematoma in the left frontal temporal parietal regions, with mass effect of the right lateral ventricle causing a displacement of the midline (Figure 1A).

Surgery was performed using a burr-hole technique, subdural drainage was placed for 48 hours, local hemostasis was optimal, and no preventive anticoagulation was undertaken.

After 48 hours in the intensive care unit, the patient presented with fever, shortness of breath, and arterial desaturation. CT of the chest showed bilateral multifocal ground-glass opacities, consistent with COVID-19 pneumonia and not found on the initial CT of the chest (Figure 1D and E), and his oropharyngeal swab tested positive for severe acute respiratory syndrome coronavirus 2 by reverse-transcription polymerase chain reaction assays. No other respiratory viral pathogens were detected. He received supportive care and anti-COVID-19 treatment according to the national protocol, including hydroxychloroquine and azithromycin, low-dose glucocorticoid, and vitamin therapy combining zinc and vitamin C. The laboratory results indicated elevated C-reactive protein (140 mg/L), normal white blood cell count (6090/ $\mu$ L), lymphopenia (260/ $\mu$ L), and thrombocytopenia (109,000/ $\mu$ L).

The patient's oxygen saturation decreased to 75%, and he was started on noninvasive mechanical ventilation. Shortly after, he presented with impaired consciousness with anisocoria. He was

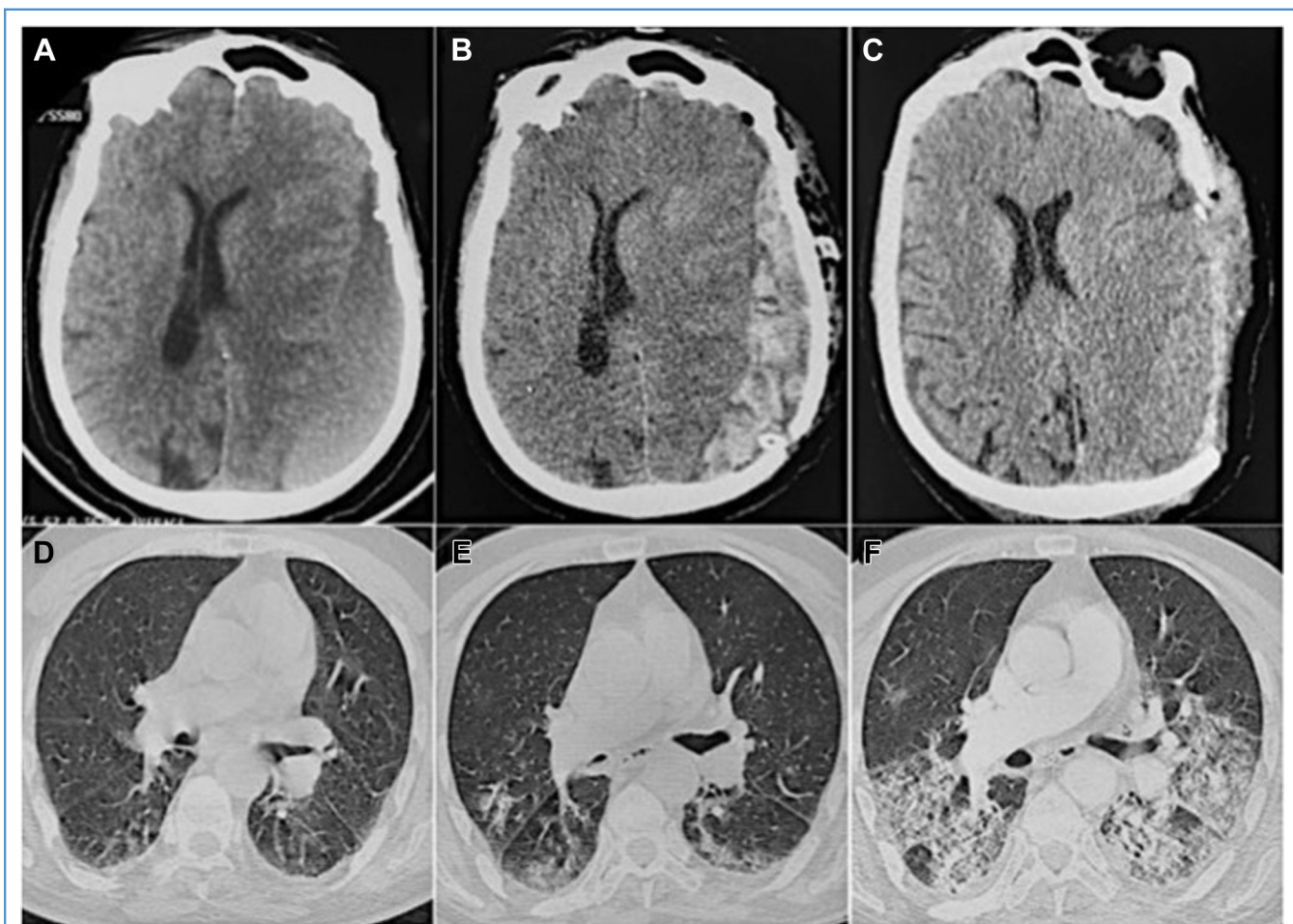


Figure 1. Computed tomography changes of the brain (A–C) and lung lesions (D–F) during the hospitalization of our case.

urgently intubated and put on mechanical ventilation. The control CT of the brain revealed a large rebleeding of the subdural hematoma (Figure 1B), and he had progressive bilateral ground-glass opacities on the CT of the chest (Figure 1F). A surgical revision was carried out, after family consent, for decompression of the left cranial flap and duraplasty with good control CT of the brain (Figure 1C). Unfortunately, the patient continued to have progressive multiorgan failure with worsening respiratory failure and renal failure. After being comatose for 3 days, he went into cardiopulmonary arrest and passed away. The patient's family has provided consent for the publication of this article.

To our knowledge, this is the first documented case to report a patient with COVID-19 with a complication of cerebral rebleeding after surgery of a chronic subdural hematoma. We speculate that the severe acute respiratory syndrome coronavirus 2-induced cytokine storm contributed to progressive multiorgan failure and also may have led to a cerebral hemorrhage in this patient despite the fact that he was not on anticoagulants. This case indicates the complexity of COVID-19 comorbidity. It affects the surgical outcome of chronic subdural hematoma.<sup>4</sup> On the one hand, the viral infection provoked thrombocytopenia, thus increasing the risk of postoperative hemorrhages.<sup>5</sup> On the other hand, the immune system could have been impaired by surgical procedures, thus facilitating the development of interstitial pneumonia.<sup>6</sup> Whether this is a coincidence or an inevitable correlation, the pathophysiologic mechanism requires further study. The patient had no exact close contact history, and initial CT of the chest did not have the typical COVID-19 features, which may be related to the masking of combined hypostatic pneumonia. Clinicians should be careful in this pandemic period

regarding the possibility of an undeclared COVID-19 infection, especially in asymptomatic patients who required close monitoring during their hospitalization.

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