

## Letter: Perioperative and Critical Care Management of a Patient With Severe Acute Respiratory Syndrome Corona Virus 2 Infection and Aneurysmal Subarachnoid Hemorrhage

To the Editor:

As of April 20, 2020, over 2 million infections by the severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) have been reported and 166 256 people have died from corona virus disease 2019 (COVID-19).<sup>1-4</sup> As the surge continues, the management of neurosurgical patients infected with SARS-CoV-2 may become increasingly complex due to competing therapeutic goals. We describe the perioperative and neurocritical care management of the first reported patient with asymptomatic SARS-CoV-2 infection and aneurysmal subarachnoid hemorrhage (aSAH).

### CASE PRESENTATION

#### Patient Information

A 56-yr-old, right-handed Caucasian female was transferred by an outside facility for definitive management of SAH (Hunt and Hess [HH] Grade II and World Federation of Neurological Surgeons [WFNS] Grade I).<sup>5,6</sup> The decision was made to test for SARS-CoV-2 given exposure to a concurrent outbreak of COVID-19 in the neuro-intensive care unit (neuro-ICU) at the time of admission.

#### Diagnostic Assessment

Noncontrast computed tomography (CT) head revealed aSAH with a modified Fisher grade of I.<sup>7</sup> CT angiography with 3-dimensional reconstructions showed a 1.6 × 1.0 cm irregularly shaped saccular right middle cerebral artery (MCA) bifurcation aneurysm with a wide neck, and with anterior and superior M2 MCA branches in a reflex angle (>180°) configuration. Chest radiograph showed subtle interstitial opacities. Nasopharyngeal swab specimens collected at the time of admission detected SARS-CoV-2. Postoperative cerebrospinal fluid (CSF) samples were also tested for SARS-CoV-2 viral ribonucleic acid (RNA), which was not detected.

#### SARS-CoV-2 Specimen Collection and Processing

Initial specimens for clinical testing were obtained via deep nasopharyngeal swab and placed in 3 mL BD<sup>TM</sup> (QuadMed, Inc) universal transport media for analysis with an Emergency Use Authorized (EUA) laboratory-developed test (LDT) with reverse transcription quantitative polymerase chain reaction (RT-qPCR).<sup>8</sup> CSF samples were obtained via a VentriClear<sup>TM</sup> I (Medtronic) antibiotic impregnated external ventricular drain catheter placed at the time of surgery. CSF sample was obtained

on hospital day 6, 5 d after testing positive for SARS-CoV-2 and evaluated by RT-qPCR.

#### Minimizing Exposure

Prior to and after surgery, the patient was transferred to a negative-pressure room for both induction of general anesthesia and later extubation.<sup>9</sup> In order to limit postoperative exposure and to conserve personal protective equipment (PPE), daily rounding was limited to only 1 member of the neurosurgical team using teleroounding via Zoom.<sup>10</sup>

#### Intervention and Neurocritical Care Management

The patient underwent craniotomy for aneurysm clipping, which required neck reconstruction with three 90° angled clips. She did not experience any perioperative complications and remained neurologically intact. Postoperative CT angiogram of the head showed appropriate clip reconstruction with no compromise of M2 MCA branches.

Pulmonary edema is frequently an early or late complication of aSAH and can also be induced or exacerbated by hyperdynamic (triple-H) therapy.<sup>11</sup> Therefore, careful attention was placed on the fluid balance of this at-risk patient. On hospital day 5, her chest radiograph was notable for bilateral diffuse opacities. She remained asymptomatic and with oxygen saturation > 95% on ambient air. Her fluid balance status was kept slightly negative and findings improved 2 d later without any need for diuresis.

#### Follow-up and Outcomes

The patient was monitored in the neuro-ICU for a total of 6 d (postbleed day 12) and subsequently transferred to a dedicated COVID-19 acute care unit. She was discharged home on postoperative day 6 with a modified Rankin scale of 1.<sup>12</sup> The patient was instructed to quarantine for 14 d. She has a telemedicine appointment scheduled for postoperative follow-up. At 20 d, no one involved in her care has reported symptoms of infection with COVID-19 or has tested positive for SARS-CoV-2.

### DISCUSSION AND CONCLUSIONS

This patient had favorable HH Grade and minimal blood burden on imaging on presentation, which have been associated with good outcomes.<sup>5-7</sup> Her aneurysm was complex and clipping was favored over an endovascular approach to avoid the use of antiplatelet therapy in the acute setting. Testing of CSF in a SARS-CoV-2-infected patient is also reported here, which to our knowledge has not been documented in the peer-reviewed literature. The limit of detection of the assay used is on a par with the most sensitive tests available, but the presence of the virus at extremely low concentrations (<25 viral copies/mL) cannot be definitively ruled out.

With this case we outline measures that can be used to limit exposure and conserve PPE. This case also illustrates the need for a delicate balance in the setting of competing therapeutic goals, and that complex neurosurgical procedures may be performed safely with appropriate precautions. The present approach to the management of this patient with aSAH may provide some insight when caring for patients with urgent/emergent surgical pathologies in the setting of SARS-CoV-2 infection.

### Disclosures

The authors have no personal, financial, or institutional interest in any of the drugs, materials, or devices described in this article.

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