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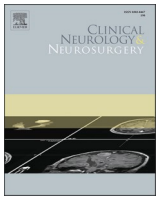

Case Report

Simultaneous bilateral mechanical thrombectomy in a patient with COVID-19

Omaditya Khanna, Karim Hafazalla, Fadi Al Saiegh, Rizwan Tahir, Victoria Schunemann, Thana N. Theofanis, Nikolaos Mouchtouris, M. Reid Gooch, Stavropoula Tjoumakaris, Robert H. Rosenwasser, Pascal M. Jabbour *

Department of Neurological Surgery, Thomas Jefferson University Hospital, Philadelphia, PA, USA

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ABSTRACT

Owing to systemic inflammation and widespread vessel endotheliopathy, SARS-CoV-2 has been shown to confer an increased risk of cryptogenic stroke, particularly in patients without any traditional risk factors. In this report, we present a case of a 67-year-old female who presented with acute stroke from bilateral anterior circulation large vessel occlusions, and was incidentally found to be COVID-positive on routine hospital admission screening. The patient had a large area of penumbra bilaterally, and the decision was made to pursue bilateral simultaneous thrombectomy, with two endovascular neurosurgeons working on each side to achieve a faster time to recanalization. Our study highlights the utility and efficacy of simultaneous bilateral thrombectomy, and this treatment paradigm should be considered for use in patients who present with multifocal large vessel occlusions.

1. Introduction

Patients presenting with acute stroke owing to bilateral large vessel occlusions (LVO) is a rare entity, with only a handful of reported cases in the literature [1,2]. Underlying medical conditions that result in a hypercoagulable, pro-thrombotic state may predispose patients to more extensive thrombo-embolic events.

The SARS-CoV-2 virus has been implicated in an increased incidence of cryptogenic stroke, particularly amongst young patients without any known risk factors. This phenomenon is thought to be a result of the hypercoagulable state owing to systemic inflammation from cytokine storm, and direct viral injury causing endotheliopathy leading to vessel thrombosis [3].

Herein, we present a case report of a patient who presented with bilateral anterior circulation large vessel occlusions, who was incidentally found to be COVID-19 positive upon emergent admission screening but otherwise asymptomatic, and was successfully treated via simultaneous mechanical thrombectomy with excellent clinical outcome.

2. Case report

The patient is a 67-year-old female non-smoker with a past medical history of hypertension who presented with acute onset of aphasia and right-sided hemiparesis. Upon arrival of emergency medical services, she was found to be unresponsive, and was intubated for airway protection and transported to an outside hospital, where a CT angiogram showed an occlusion of the left carotid terminus extending into the M1 segment of the left middle cerebral artery, as well as a separate proximal M2 occlusion of the right M2 segment of the middle cerebral artery. CT perfusion imaging showed bilateral increase in mean transit times within the right and left MCA territories, with a corresponding decrease in cerebral blood flow (Fig. 1). The lung apices visualized on the CT angiogram showed scattered ground glass opacities suggestive of infectious or inflammatory disease; a COVID-19 swab performed as part of general hospital emergent admission protocol later came back positive.

Upon transfer to our institution, the patient's neurological exam was poor: she was globally aphasic, with a complete right-sided hemiplegia, withdrawing to pain minimally on the left side. Given the patients clinical and radiographic findings, the decision was made to take her for emergent mechanical thrombectomy.

The patient was taken to Interventional radiology suite and bilateral femoral sites were accessed for bilateral mechanical thrombectomy with the attending neurosurgeon and endovascular fellow working in conjunction on each side. Each femoral artery was catheterized with an

* Correspondence to: Division of Neurovascular Surgery and Endovascular Surgery, Thomas Jefferson University Hospital, Philadelphia, PA 19107, USA.
E-mail address: pascal.jabbour@jefferson.edu (P.M. Jabbour).

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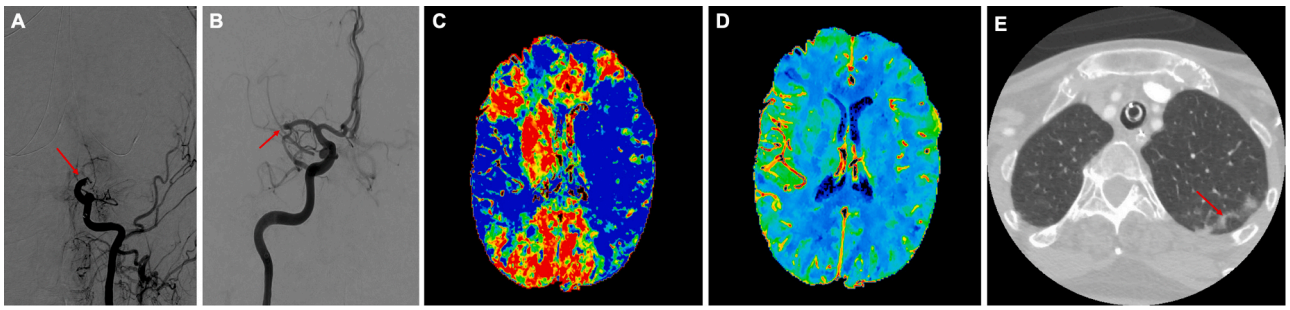

Fig. 1. A 67-year old with COVID-19 presents with bilateral large vessel occlusions of the left carotid terminus (A) and right M2 segment of the MCA (B). Increased mean transit times are appreciated in the bilateral MCA territories (C), with preservation of cerebral blood volume (D), indicating a bilateral large territory at risk. The apex of lung parenchyma seen on CT angiogram showed groundglass opacities suggestive of infectious process (D).

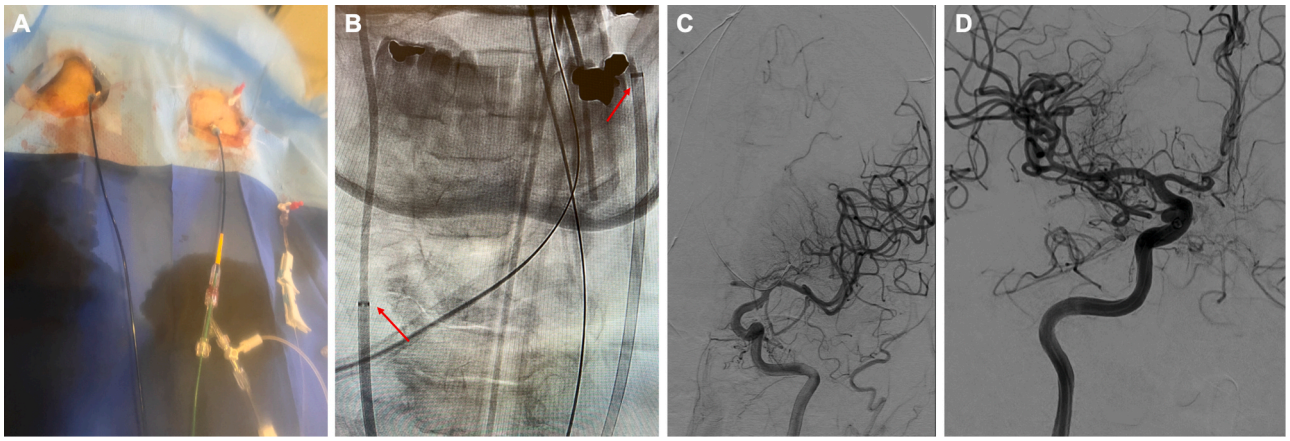

Fig. 2. Bilateral femoral access was achieved (A), and a 90-cm Neuronmax was used to catheterize the bilateral internal carotid arteries (B). Using a suction aspiration technique, TICI 3 vascularization was achieved bilaterally after one pass each (C and D).

8 F sheath, and a 5 F Berenstein catheter within a 90-cm Neuronmax sheath (Penumbra, Alameda, CA) was used to simultaneously catheterize the bilateral internal carotid arteries (Fig. 2). The bilateral occlusions were addressed at the same time, and fluoroscopy used throughout the procedure visualized both sides. A left internal carotid artery (ICA) run showed an ICA terminus occlusion. A one pass aspiration with a React 71 catheter and Riptide pump (Medtronic, Fridley, MN) was performed at the same with a right sided one pass aspiration with a React 071 too. TICI 3 recanalization was achieved after a single pass on both sides (Fig. 2).

The patient was transferred to the neurological intensive care unit (NICU). The patient was extubated without incident the following morning, and was found to be neurologically intact, without any impaired prosody of speech or residual hemiparesis. A post-thrombectomy MRI showed bilateral scattered FLAIR hyperintensity suggestive of microangiopathy, albeit no evidence of acute infarction.

The patient's stroke work-up was unremarkable: she had a normal lipid panel and HbA1c (5.6%). Trans-thoracic echocardiogram (TTE) was unremarkable for any wall-motion abnormalities, or valvular thrombi, and the patient is being considered for a LINQ device as an outpatient. The patient was started on 81 mg Aspirin daily for secondary stroke prevention.

Post-procedural lab work was also relatively unremarkable for widespread inflammatory or infectious markers. The patient had a normal CBC (WBC count of 10.5, with 85% neutrophils), and mildly elevated C-reactive protein (2.5 mg/dL) and procalcitonin (0.18 ng/mL) levels, which may represent post-procedural inflammation and sequelae of her transient ischemic attack. Hematologic work-up was significant only for an elevated D-dimer (436 ng/mL) with normal fibrinogen level (418 mg/dL). Lower extremity ultrasound was negative for evidence of any deep vein thrombosis.

3. Discussion

The incidence of patients presenting with bilateral LVO's is relatively rare, and a few cases reported in the literature have implicated underlying medical conditions that render a patient into a pro-inflammatory, pro-thrombotic state as being at especially increased risk. This past year, several case reports have shown an association between COVID-19 and risk of ischemic stroke, particularly in patients without any other known cardiovascular risk factors. Stroke has also been reported to be the presenting symptom in patients with previously unknown COVID-19 infection [4]. Although the pathophysiologic causation between COVID-19 and ischemic stroke has yet to be elucidated, it is thought that a systemic pro-inflammatory cascade coupled with direct injury of blood vessels renders patients at increased risk of thromboembolic injury.

We present a case report of a 67-year-old female without any significant risk factors who presented with bilateral large vessel occlusions of the anterior circulations, who was found to be COVID-19 positive on admission screening despite not having any systemic or respiratory symptoms. This case, as well as others that have been reported in the literature, underscore the importance of maintaining proper precautions when treating patients with neurological disease with unknown COVID status. Particular attention should be paid to the lung parenchyma when reviewing CT angiograms of the head and neck as part of stroke work-up, as there may be radiographic findings suggestive of SARS-CoV-2 infection. Furthermore, all patients who present with acute neurological changes with unknown COVID status, even if they are admittedly asymptomatic, should undergo prompt testing, and treatment should occur with full COVID-19 precautions until results of the test are

finalized [5].

Patients with multifocal vessel occlusions are likely to present with high NIHSS scores, highlighting the severity morbidity and mortality associated with this condition. It is imperative to pursue a treatment strategy that facilitates reperfusion. In patients with concomitant anterior and posterior circulation (e.g. basilar occlusion) thrombi, it may be prudent to focus initial attention on the latter given its critical blood supply to the brainstem. In patients with concomitant anterior circulation occlusions, simultaneous thrombectomy via bilateral access should be considered in order to give the patient the best chance of achieving a functional recovery. Our study, as well as several others that have described this technique, gives credence to the treatment paradigm of simultaneous bilateral thrombectomy as a safe and efficacious way of patients presenting with multifocal large vessel occlusions.

4. Conclusion

In patients presenting with bilateral large vessel occlusions, simultaneous treatment via bilateral arterial cannulation should be considered to achieve faster time to recanalization. At institutions where two neuroendovascular practitioners are available, each can work on either side to achieve arterial access and selectively catheterize vessels of interest. In our case, bilateral mechanical thrombectomy was performed simultaneously to try to maximize chances of recovery, this technique should always be considered in cases where the patients have bilateral occlusions as long as 2 operators are available.

Competing interests

The authors report no competing interests.

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