ASK THE EXPERTS

COVID-19 and Stroke: Practice Adaptations That Made a Difference

Insights into key steps that have been implemented to help manage stroke patients during the COVID-19 pandemic.

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In south Texas, COVID-19 did not have a significant effect on our practice early on in the pandemic, but it became a totally different world after Memorial Day when the state started easing restrictions and reopening. Today, our area has approximately 3.5% of the population of Texas but has approximately 15% of all COVID-19–positive hospitalizations in Texas. Thankfully, we have had more than 2 months of preparation, and the one practice adaptation that has made the biggest difference is the use of telemedicine (virtual visits). In late March, we started making changes to the inpatient and outpatient services in order to safely evaluate and treat patients on the stroke service, whether or not they were COVID-19–positive. With the implementation of telemedicine and the use of Viz LVO and Viz CTP (Viz.ai), we can communicate with the emergency department (ED) staff to appropriately triage acute strokes very quickly and have not seen a significant change in the door-to-device time for patients receiving mechanical thrombectomy. The inpatient stroke service has been able to see patients in the ED and initiate power plans, and the workup is typically started before the patient receives a bed in the stroke unit or neurology intensive care unit (ICU). With virtual visits, rounding throughout the hospital (ED, COVID-19 unit, stroke unit, step-down unit) has been very efficient. For example, we can see a dozen stroke patients waiting in the ED every day by 8 AM, so there is no delay in their stroke workup or recommendations. At the peak of the Texas COVID-19 census (when the hospital was at 110% capacity), some patients actually had the complete stroke workup and were discharged after spending 2 days in the ED, without ever going up to the stroke unit. The other major benefit of the virtual visits is that we can save precious personal protective equipment (PPE), which is crucial to the ED and ICU staff due to the nationwide shortage.

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We were hit hard in the Northeast and in Boston in particular. Early on in the course of the COVID-19 outbreak as we watched the challenges in Italy, we convened a group called the Northeast Comprehensive Stroke Center (CSC) Collaborative. This group, composed of stroke leadership from the region's CSCs, met virtually every week to share experiences and best practices across seven states. This proved invaluable in two ways: First, we were all undertaking various changes to our processes, and the forum allowed us to share these local approaches and advise each other on refinements. Second, we were able to coordinate a regional triage process through the collaborative in the event that any single CSC was overwhelmed with COVID-19 admissions and could not accept acute stroke patients. This triage was required for three of our centers during March and April 2020, the peak of the pandemic here. Referring hospitals used their usual referral process, but triage of the patient to a thrombectomy-enabled environment occurred at the level of the CSC, based on a shared centralized process. In this way, we rapidly were able to construct a resilient system to maintain access to advanced stroke therapeutics in the face of the immense strain applied to the system by COVID-19 admissions. It provided a strong sense of shared determination and community in addition to the manifold therapeutic advantages. This group currently is exploring options for research in the COVID-19 aftermath here and preparing for a possible second wave in the fall or winter. I would recommend regions being affected now to consider similar approaches if they haven't already. Collaboration and flexibility are the keys to success.

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At the USC hospitals, our goal is to ensure safe and timely endovascular treatment for acute stroke patients while minimizing the risk of infectious exposure for both health care workers and patients. We have adapted our practices in the setting of the COVID-19 pandemic. In the case of emergent endovascular procedures such as mechanical thrombectomy for acute stroke, because there is a lack of appropriate COVID-19 testing, we consider all patients to be "COVID-19 positive" or "COVID-19 rule out." We obtain a COVID-19 test at the earliest possible time after arrival to our hospitals to enable postprocedure disposition. The patient is transported to the radiology department for acute stroke imaging. We do not have a dedicated CT scanner for patients with suspected or confirmed COVID-19; however, our radiology departments have protocols and procedures in place for expedited decontamination based on Centers for Disease Control and Prevention (CDC) guidelines.

As soon as the need for an emergent endovascular procedure is confirmed, we electively intubate the patient in the ED or ICU negative airflow room before arrival to the neuroangiography suite. We transport the patients to the neuroangiography suite using transport ventilators with exhaust port viral/bacterial filters and keep the transport ventilator for the duration of the procedure to avoid breaking the ventilator circuit while outside of a negative pressure room. Physical barriers/dividers are placed in the operating rooms, and all equipment is isolated for COVID-19–positive/rule out procedures. After completion of the procedure

and once admitted to the ICU, attempts are made to extubate the patient as soon as deemed safe. Of note, we do not have a dedicated neuroangiography suite for COVID-19 patients or suspected cases; however, after each procedure, our suite undergoes a terminal clean of all exposed material from ceiling to floor, including lighting. Endovascular surgeons and neuroangiography suite personnel caring for patients assume all of the emergent cases are COVID-19–positive and are provided with N95 masks or equivalent respirators for each procedure. Furthermore, we use CDC-recommended PPE for COVID-19, which consists of handwashing, surgical mask, hair covering, eye protection, nonsterile contact gown, and gloves during the procedure.

These adaptations have made a difference. To date, we have been fortunate and have not had any COVID-19 transmission to or among health care workers or patients. We have streamlined the process so that it adds little extra time to the procedure. It is worth mentioning that at the beginning of the pandemic, our neuroendovascular team had a training session with the infection control department of our health system for proper PPE utilization and to familiarize the team with the COVID-19–related workflow changes, such as donning and doffing of PPE, thereby minimizing treatment delays.

For urgent endovascular procedure such as ruptured aneurysm embolizations, nasopharyngeal swab polymerase chain reaction (PCR) testing is obtained on all patients prior to the procedure, regardless of whether they have any COVID-19–related symptoms. We proceed with the procedure as soon as testing results are obtained. If the result of testing is positive, we proceed according to the same protocols noted previously. If the result is negative, our team members wear masks (N95 or surgical), eye protection, gloves, and a gown.

In our institution, all patients coming in for an elective endovascular procedure will also undergo nasopharyngeal swab PCR testing prior to the procedure. If the result is positive, the procedure is postponed until the patient is no longer infectious and has shown recovery from COVID-19 with negative results from two PCR tests ≥ 24 hours apart.

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Over the past several months, endovascular cerebral surgery has adapted to the restrictions imposed by the COVID-19 pandemic on a global scale. Endovascular care of emergent stroke patients has improved as hospitals become better equipped with PPE and physicians have gained expertise in the management of these patients. Our initial experience regarding stroke patients with COVID-19 at Thomas Jefferson University Hospital suggested a correlation of stroke incidence with younger patients without significant comorbidities. In addition, we observed that these patients tended to have an increased thrombus burden, such as tandem extracranial and intracranial occlusions. The protocol for both endovascular and medical management of these patients was adapted to provide best practice outcomes. All stroke patients were examined emergently through our established telehealth network during both admission and postoperative outpatient follow-up. Robotic video rounds were also used in the neurologic intensive care and stroke units. This minimized potential viral exposure for the patient and associated medical staff.

In the emergent endovascular management of these patients, the endovascular team was prepared for complex thrombectomy procedures, at times incorporating stenting of an occluded proximal cervical internal carotid artery and distal intracranial thrombectomy. The utilization of intraoperative anticoagulation and antiplatelet therapy was more frequent. Based on the potential for particle aerosolization during surgery with coughing and secretions, the neuroanesthesia threshold to intubate was lowered, especially in patients with aphasia or a posterior circulation stroke. In the postoperative medical management of these patients, collaboration of our institution's stroke neurology and the vascular medicine antithrombotic service allowed for the implementation of protocols, which included indications for early systemic anticoagulation in some high-risk patients.

Overall, the management of cerebral aneurysms in COVID-19 positive patients was not significantly altered. However, patients with systemic COVID-19 were more likely to be treated via a minimally invasive endovascular route to decrease operative time and potential pulmonary complications from prolonged intubation procedures.

All elective endovascular and cerebrovascular patients are required to be tested via a nasopharyngeal PCR swab within 72 hours from the procedure. Positive tests require a 14-day retesting and procedure rescheduling, to the surgeon's discretion.

In sum, the endovascular community continues to provide excellence in health care delivery of cerebrovascular patients during the COVID-19 pandemic. Until an effective vaccine becomes available, heightened clinical acumen and hypervigilance remain stalwart principles. ■