Maintaining a Robust Acute Stroke Care Network During the COVID-19 Pandemic

A perspective on how a busy health care system in New York City adapted to ensure appropriate stroke care during pandemic conditions.

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During April 2020, the peak of the coronavirus (COVID-19) pandemic in New York City, there were 6,000 daily new infections with the SARS-CoV-2 virus, with > 500 deaths reported each day.[1] To accommodate the physical strain on the health care system, officials from the city hospital administration tripled the bed capacity throughout the boroughs, adding nearly 800 intensive care unit beds to treat critically ill patients.[2] Although most admissions were due to the respiratory and infectious sequelae of COVID-19, we observed a concurrently increased incidence of emergent large vessel occlusion (ELVO) acute ischemic stroke presenting to our health system hospitals during this time, possibly related to a hypercoagulable state induced in these patients.[3] In this article, we share our perspective on maintaining a robust acute stroke care network during pandemic conditions.

STROKE CARE NETWORK MODEL

The Mount Sinai Health System includes eight hospitals, seven of which are spread around New York City, accounting for nearly 8,000 hospital beds. For the neurosciences specifically, we have two dedicated neurointensive care units staffed by neurocritical care faculty. Our stroke care network consists of one centralized comprehensive care center, surrounded by three thrombectomy-capable stroke centers and a network of referring primary stroke centers, both within and external to our health system. As we have previously reported,[4] our model for acute stroke treatment is one of "trip-and-treat," defined by mobilizing the neurointerventional team to a satellite thrombectomy center for rapid endovascular treatment, as opposed to always transferring a patient into a centralized stroke hospital for thrombectomy. For patients with ELVO presenting to a nonthrombectomy-capable center, the patient and neurointerventional team are simultaneously transferred to whichever thrombectomy center is geographically closest for endovascular treatment. We have found this strategy to facilitate fast overall stroke recanalization times.

HOW THE NETWORK ADAPTED TO COVID-19

Department Structure

The first major change to normal operations during the early COVID-19 pandemic was reorganization of our departmental structure. Given the expected need for critical care services, our neurointensive care unit was converted into a high-volume COVID-19 unit, with two beds and ventilators per room, staffed by our neurocritical care intensivists and providers. Reallocation of personnel left a gap in routine neurointensive care for non-COVID-19 patients with ischemic or hemorrhagic stroke, neurotrauma, and other neuroemergencies, which was filled by neuroendovascular faculty and neurosurgery residents. To relieve additional burden on the health system's peripheral hospital intensive care units, the overwhelming majority of neurocritical care was centralized to the comprehensive stroke center in Manhattan.

As cases of COVID-19 grew, we also noted an increase in ELVO incidence across our acute stroke network.[5]

As we recently reported, during the 3-week period of peak COVID-19 incidence (March 21-April 12, 2020), 45 patients with ELVO were evaluated, 53% of whom were confirmed positive for COVID-19 infection. Ultimately, 20 (44%) patients were treated with endovascular thrombectomy. During this time, we noted an influx of younger patients with fewer comorbidities presenting with concurrent COVID-19 and ELVO, a concerning finding reported by Oxley et al.[6] This finding has been corroborated in a larger series comparing patients with ELVO presenting before or during the COVID-19 pandemic, with the COVID-19–era cohort being significantly younger age and having better functional baseline (modified Rankin Scale) compared to the pre-COVID-19 cohort.[5] A retrospective case-control study at our institution compared neuroimaging of patients with acute ischemic stroke and observed that infection with COVID-19 was an independent risk factor for positive acute stroke imaging.[7]

Postoperative Transfer

During the COVID-19 pandemic, our acute stroke workflow was similar to prepandemic times. We continued to adhere to the "trip-and-treat" model for the mobile neurointerventional team, treating patients at satellite thrombectomy centers. However, one difference was the postoperative transfer of patients to the centralized neurocritical care unit to relieve the burden on the satellite intensive care units, which at the time were inundated with critically ill COVID-19 patients. During the peak pandemic, we performed significantly more endovascular thrombectomies in the boroughs of Brooklyn and Queens, the areas with the highest incidence of COVID-19 (unpublished data).

Infection Prevention Strategy

Prior to performing a thrombectomy procedure, we followed a strict infection prevention strategy to ensure the safety of the neurointerventional team, technologists, nurses, and anesthesia team. This included maintaining a dedicated COVID-19–only interventional suite for all patients under investigation. All nonessential devices for the single procedure were removed from the room. In addition, full airborne personal protective equipment was required for all providers involved in the thrombectomy. Most importantly, once we recognized the high rate of COVID-19 positivity among stroke patients, all stroke patients were designated as patients under investigation until proven otherwise by a nasopharyngeal swab.

As published in our early case series of the first ten thrombectomies during the COVID-19 pandemic,[8] good radiographic and clinical outcomes were observed after endovascular reperfusion for ELVO. Furthermore, by following our strict guidelines, to our knowledge, only one team member had confirmed COVID-19 infection during this time, which appeared to be from community spread, although this cannot be confirmed. In our larger case series (manuscript in preparation), there were no differences in the rates of successful reperfusion (thrombolysis in cerebral infarction ≥ 2B) or short-term neurologic recovery (National Institutes of Health Stroke Scale score from admission to discharge) between pre-COVID-19 and COVID-19 cohorts. Taken together, these results suggest that endovascular thrombectomy should be offered to patients with COVID-19.

SUMMARY

It is our hope that sharing this experience will aid other communities experiencing the devastation of COVID-19. Given the very persistent need for thrombectomy care during COVID-19, we encourage other systems and communities to take special efforts to ensure continued care for this vulnerable population. ■

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