

Commentary in response to 'Impact of the COVID-19 pandemic on the process and outcome of thrombectomy for acute ischemic stroke'

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The current COVID-19 global pandemic could potentially affect emergent large vessel occlusion (ELVO) ischemic stroke¹ through at least two mechanisms. The first is possible increased stroke incidence due to procoagulant effects of the virus or the immune response to it.²⁻⁵ The second, more tangible, is the effect on ELVO triage and treatment times, a phenomenon already reported for emergent care of myocardial infarction⁶ and recently for acute stroke care during COVID-19 disruption in France.⁷

On the JNIS website currently is a paper from the Chinese epicenter, focused on the second of these. The authors present a single-center experience during the height of the pandemic (total lockdown in Wuhan until the end of newly diagnosed cases) and compare time intervals and procedural outcomes to pre-pandemic cases. Importantly, this is distinct from confirmed and suspected COVID-19 patients undergoing thrombectomy. Those patients were transferred from the community directly to a sequestered hospital environment; their treatment and outcomes after stroke remain unknown. Only limited case series have been published to date about treatment of known COVID-19-positive patients with stroke.^{8,9} The current paper is focused instead on the impact of the required modifications in the processes for patients with ELVO during the COVID-19 pandemic. Delays were expected because of expanded patient evaluation and staff protection needs under the auspices of the local version of Protected Code Stroke.¹⁰

Protected Code Stroke is an approach to emergent patient evaluation that ensures staff protection from airborne or contact-based infectious disease. The Chinese Federation of Interventional and Therapeutic Neuroradiology (CFITN) and the Chinese Society of Cardiology (CSC) had recommendations predating societal output in the USA. Judging from the references listed in the more recent documents,^{11,12} however, they debatably helped inform them, underscoring the importance of multinational collaboration and communication during global disease outbreaks. The authors of the current publication found that COVID-19 screening and personal protective equipment applications predictably delayed cases, by an average of 50 min in their experience. Other features between pre- and intra-pandemic groups studied were consistent with typical ELVO care, with utilization of procedural conscious sedation and equivalent Thrombolysis in Cerebral Infarction 2b/3 rates. In addition, the measures to protect staff¹³ (including the establishment of a negative pressure angiography suite) were effective, with a zero rate of infection reported in staff.

Outcomes reported were unchanged despite the 50 min delay in care, but are only available to day 7 post-procedure. Whether this would be true for an outcome of 90-day modified Rankin Scale is uncertain and is a major limitation of the paper. This equivalence in early neurological outcomes, as the authors acknowledge, is likely an artifact of sample size. With the time dependence of stroke, it seems inevitable that the ELVO patient population will be compromised by delay. In addition, with larger sample sizes, it would be helpful to consider the impact of the Protected Code Stroke for patients presenting in-hours versus after-hours and for directly presenting versus transfer patients. Furthermore, consideration of the major sources of in-hospital delay, such as from door to imaging time or imaging to puncture time, would be helpful.

We accept COVID-19 screening is time consuming, and this paper aims to provide quantification of that under the process described. Processes are expected to refine and streamline, and as we settle into what increasingly seems a potential chronic or relapsing period of handling COVID-19 risk, our triage and treatment times should reflect this. The same will apply for possible future pandemics.^{14,15}

What does the paper tell us? That thrombectomy in a region on lockdown can be successful despite the impact of extra precautions required because of COVID-19. However, consider what is not reported here. The authors report a 67% rate of patients with ELVO screened but not treated with endovascular thrombectomy, but do not provide details about how this divided out pre- and intra-pandemic. Imaging and clinical standardization should make treatment groups reasonably homogenous. That is the very nature of treatment selection, to reduce variance. So it should not surprise us that patient groups are similar, with the exception of overall treatment delay. That is the numerator.

It is the elusive denominator that remains difficult to discern, and this is where the true impact of the pandemic lies. What are the details for the stroke patients diverted directly from the field to dedicated COVID-19 hospitals? This is a population of great interest, both in terms of the frequency and outcome from ELVO stroke,⁹ and the nature of cerebrovascular disease in the COVID-19 population in general.¹⁶ Independent of this, how many patients at home did not present in time for treatment consideration because of isolation brought on by social distancing requirements?¹⁷ How many families of victims or victims themselves delayed calling for help due to fears of acquiring the infection by being transported to the hospital? Data from the USA¹⁸ and Europe¹⁹ suggest that this number may be substantial. What systemic delays were introduced by resource saturation of ambulance transportation and emergency medical systems? And, finally, how many patients had lost tenuous penumbral tissue by the time they were evaluated, impacting their opportunity to receive treatment or chance to recover following it? The accumulated impact of these considerations is the true ELVO coin paid during the pandemic.

Pandemic epicenters are gathering themselves after the onslaught of this new disease. A better understanding of the impact of COVID-19 will emerge, but it is encouraging that these early data

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suggest that ELVO processes continue to afford patients treatment benefit, despite inevitable delays. It remains essential that access to such treatment is protected as a health system priority. The magnitude of benefit from thrombectomy²⁰ and subsequent societal gain is too great to accept otherwise.

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