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Challenges in Adapting Existing Hyperacute Stroke Protocols by a Tertiary Neuroscience Centre for Patients with COVID – 19 in Singapore

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Abstract

COVID-19 patients can also present with hyperacute stroke and current stroke workflows are insufficiently equipped to treat such patients. We have created a harmonized stroke protocol to safely continue hyperacute stroke therapy for such patients whilst minimizing the risk of exposure and cross contamination.

Keywords: Stroke; Hyperacute protocol; COVID-19; Personal Protective Equipment (PPE)

Introduction

Coronavirus disease 2019 (COVID-19) has been a significant regional and global health burden since it was first reported in Wuhan, China on 31 December 2019. There have been over 170,000 cases reported with 7400 deaths as of 17 March 2020. Neurological symptoms of COVID-19 patients such as headache and giddiness only accounted for 6.5% and 9.4% in a group of 138 hospitalized patients with COVID-19. Another retrospective case series study of 214 COVID-19 patients in Wuhan had 78 (36.4%) patients with neurological manifestations, 6 of the 214 (2.8%) had acute cerebrovascular diseases. This article discusses issues pertaining to the adaptation and implementation of current hyperacute stroke protocols for suspected and confirmed COVID-19 patients [1-5].

Rationale for adapting pre-existing workflows

Our centre (National Neuroscience Institute, NNI) is a designated tertiary hyperacute stroke centre that manages the largest number of hyperacute stroke cases (1500 – 2000 cases/year) in Singapore. NNI also has direct access to the National Centre for Infectious Diseases (NCID) which is designated the national centre for suspected and confirmed COVID-19 patients. To date NCID has also managed 181 out of 266 confirmed COVID-19 patients in Singapore as of 15 March 2020.

We recognize the unique situation of COVID-19 patients who may present concurrently with hyperacute stroke and acknowledge that our current protocols are insufficiently equipped to treat such patients. A multidisciplinary workgroup was formed in January 2020 to develop a harmonized hyperacute stroke protocol to safely continue hyperacute stroke therapy (intravenous thrombolysis, endovascular therapy) whilst minimizing the risk of exposure and cross-contamination of non COVID-19 stroke patients and hospital healthcare workers. We also aimed to reinforce personal protective equipment (PPE) compliance and maintain Door-To-Needle (DTN) times (target < 60 minutes). The recommendations aresummarised in table 1.

Usual hyperacute stroke protocol
· Early neurological assessment by neurologist in ED
· Rapid brain imaging
· Decision for thrombolysis and/or EVT
· Right-siting of specialized periprocedural care of patients (Neuroscience ICU)
Modifications to usual hyperacute stroke care in COVID-19 patients
· A designated screening center for all suspect/ confirmed cases based on suspect case definition for COVID-19 by Ministry of Health, Singapore (dated 9Mar 2020)
· Use of Tier-2 Personal Protective Equipment (PPE) when performing early neurological assessment
· A dedicated brain imaging facility separate from non COVID-19 patients
· Intubation of all patients requiring EVT in a safe environment
· Defined transport route
· Post-procedure neuro-monitoring at dedicated multidisciplinary COVID-19 ICU (Outbreak ICU)

Table 1: Summary of Management for Hyperacute Stroke Patients with COVID-19.

Modifications to hyperacute stroke protocol

The stroke patient must present within 4.5 hours of onset of symptoms to be eligible for intravenous Thrombolysis (TPA) or within 6 hours for Endovascular Therapy (EVT) with mechanical thrombectomy as per current American Heart Association (AHA) 2018 stroke guidelines to optimize the benefit to the patient, taking into account stretched resources during these exceptional times.

Clinical Management of hyperacute stroke

The National Centre for Infectious Diseases (NCID) has a designated screening centre for all suspected or confirmed COVID-19 patients based on the latest Singapore Ministry of Health suspect case definition criteria (dated 9 March 2020). This will allow all COVID-19 patients with hyperacute stroke symptoms to be cohorted for early neurological assessment by Emergency Department physicians and neurologists. Once the patient is deemed eligible, urgent brain imaging will be done in NCID. We have chosen a non-contrasted CT brain followed by a CT 4-vessel angiogram as the imaging modality. This is to identify eligibility for thrombolysis and/or EVT. Furthermore, the designated CT scan room is staffed 24 hours a day and utilized only for COVID-19 patients. The room is also installed with a negative air pressure ventilation system to reduce the risk of spread of COVID-19.

The workgroup has also decided on intubating all COVID-19 EVT candidates to mitigate risk of aerosol generation and staff transmission should the patient need urgent intubation midway through the EVT procedure. The intubation will be carried out prior to EVT in a pre-specified Operating Theatre (OT) with a segregated ventilation system and negative pressure. The intubated COVID-19 patients will then be transported to the dedicated Neuro-interventional suite for EVT.

Intensive care requirements

In our local context, 2 out of 18 hospitalized patients with COVID-19 required ICU care. As such the appropriate right-siting of such patients after hyperacute stroke therapy was determined to be in the multi-disciplinary National Centre for Infectious Diseases (NCID) ICU. This decision was made due to the need for close GCS (Glasgow Coma Scale) and NIHSS (National Institutes of Health Stroke Scale) monitoring post stroke and consideration for early invasive ventilation in COVID-19 patients with respiratory symptoms. NCID ICU is also near the OT for urgent neurosurgical intervention if complications arise.

Facility Planning

We have reinforced education on proper PPE techniques and hand hygiene for HCWs as well as established online access to relevant critical care and stroke workflows. There are also new designated transport routes for COVID-19 patients when transferring from screening centre to CT room, Neuro-interventional suite, and NCID ICU. Access to the routes is granted only to HCWs with staff cards. These transport teams will be accompanied by security personnel to minimize exposure and cross-contamination during transfer. Decontamination protocols for all equipment have been put in place as per our infection control policies for COVID-19 patients. 2 familiarization drills involving HCWs have been carried out with positive feedback received.

Conclusion

To date in the literature there have been no case reports of COVID-19 patients receiving thrombolysis or mechanical thrombectomy for hyperacute stroke. However, as COVID-19 cases continue to rise, it will be a matter of time before we

encounter our first case. One advantage of our centre is the ease of access to multi-disciplinary specialists to come up with a set of best-care practices for COVID-19 patients with stroke. Going forward, our workgroup will continue to refine these workflows as we encounter these patients.

Conflict of Interest

Seet Ying Hao Christopher, Tham Hui Lian Caroland Wong Yu-Lin declare that they have no conflict of interest.

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