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ture data, SCAR18 shows geographic specificity outside Italy (Middle East, Mexico, and Morocco) [8].

We described an Italian adult case of congenital SCAR18 arising from the unreported association between a LoF variant and a deletion, with long-term follow-up and stable cerebellar atrophy since 14 years.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jocn.2020.05.008>.

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Intravenous Thrombolysis for Stroke in a COVID-19 Positive Filipino Patient, a Case Report



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ABSTRACT

The 2019 Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) which was first reported in Wuhan, China last December 2019, has been declared an emergency by the World Health Organization but eventually progressed to become a Pandemic. To date, Coronavirus Disease 2019 (COVID-19) has affected at least 100,000 individuals worldwide, reaching thousands of mortalities (Zhou et al., 2020; World Health Organization, 2020). In the Philippines, the number of COVID-19 confirmed positive cases is over 636 and is expected to rise (Department of Health, 2020). Respiratory infections alongside their comorbidities can induce acute myocardial infarction and acute ischemic stroke (Warren-Gash et al., 2018) [3]. These may further bring challenges in the management and administration of Intravenous (IV) Alteplase in eligible patients. Currently, there are no case reports in the administration IV Alteplase in ischemic stroke patients who are COVID-19 positive. We present a case of a 62-year old female who was admitted due to cough, colds and shortness of breath of 2 weeks duration and was tested to be COVID-19 positive. She suffered from an ischemic stroke while in the Medical Intensive Care Unit and was given Intravenous thrombolysis.

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1. Introduction

IV Alteplase is administered in ischemic stroke patients who are eligible for thrombolysis [4]. There is no contraindication in the administration of IV Alteplase in patients with communicable diseases [4]. COVID-19 infected more than 100,000 individuals worldwide and its numbers are still increasing [1,8]. Administering IV Alteplase in COVID-19 positive patients poses a risk and challenge

to the healthcare professionals. Respiratory infections can trigger acute coronary events and strokes along with the patient's comorbidities [3,5]. A link between COVID-19 and stroke and its outcome when given Intravenous Alteplase has yet to be reported.

2. Case report

A 62-year old female, known hypertensive, prediabetic, dyslipidemic with a history of transient ischemic attack last 2019 presented to the emergency department with cough and colds of 2 weeks duration associated with shortness of breath. She was

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initially managed as a case of Community Acquired Pneumonia, but was tagged as a Person Under Investigation (PUI) due to her occupation as a health provider. She was admitted in the Medical Intensive Care Unit, (converted to the hospital's COVID Critical Unit) with necessary precautions undertaken. During the first hospital day, she developed sudden onset of severe dysarthria and right upper and lower extremity weakness, giving a National Institutes of Health Stroke Scale (NIHSS) of 4. Plain cranial CT scan showed a subtle hypodensity in the left centrum semiovale and corona radiata (Fig. 1a). CT-angiography showed significant stenosis in the left M1 segment of the Middle Cerebral Artery (Fig. 1b). Intravenous thrombolysis (IV rTPA) was initiated at a dose of 0.9 mg/kg body weight 3.4 h post ictus with 10% bolus of the total dose given initially, followed by the remaining dose as an infusion over 1 h. Immediately after IV rTPA, the patient's right leg weakness resolved with an NIHSS of 3. Repeat plain cranial CT scan 24 h post-IV rTPA showed absence of hemorrhage. Cautious hydration was made and Aspirin 100 mg was started. However, on day 3 post ictus, his right leg was seen to be moving side to side with a cumulative NIHSS of 6. There were fluctuations in motor strength thereafter for which adjustment in IV hydration was made. She was confirmed COVID-19 positive by reverse transcription polymerase chain reaction (rRT-PCR) along with the classic findings on High-resolution CT (HRCT) of the chest showing areas of ground glass densities with focal areas of consolidation predominantly in both perihilar and peripheral regions of the lung (Fig. 2). The patient is being managed for the COVID-19 infection and is still admitted with mild dysarthria, right upper extremity falls before 10 s and right lower extremity drift (NIHSS of 4). Laboratory tests are as follows (please refer to Table 1.)

3. Discussion

On January 30, 2020, the WHO declared COVID-19 as a global emergency [2]. The most common symptoms are fever, cough and body malaise [6,7]. Sars-CoV-2 infects the respiratory tract by inducing release of inflammatory cytokines such as interleukin (IL)1 β and IL-6 by binding to the Toll Like Receptor (TLR), triggering an inflammatory cascade and resulting in Acute Respiratory Distress Syndrome. Suppression of the inflammatory mediators have been shown to limit injury [10]. Increased inflammatory biomark-

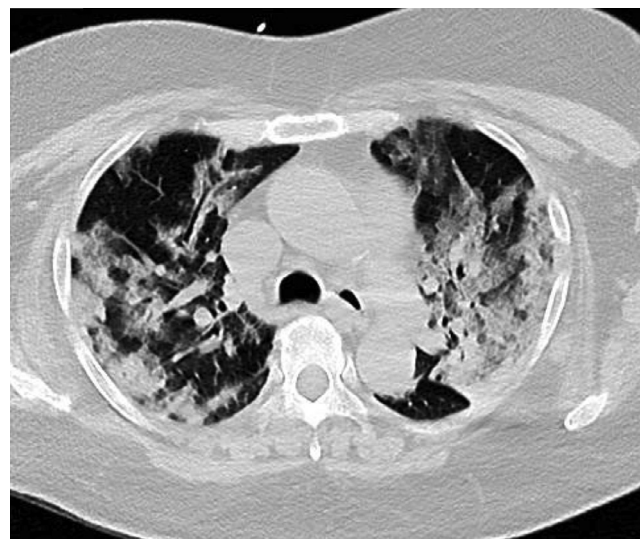


Fig. 2. Areas of ground glass densities with focal areas of consolidation predominantly in both perihilar and peripheral regions.

ers (D-dimer, C-Reactive Protein and Fibrinogen) have been shown to increase stroke severity and disability within 30 days [11], while erythrocyte sedimentation rate has not been shown to predict the outcome of stroke [12]. Chest imaging of COVID-19 patients show consolidation, ground glass opacities and bilateral lung involvement, which were consistent with findings in our patient [1,6,7]. Diagnostic parameters of COVID-19 patients show elevated D-dimer, fibrinogen, erythrocyte sedimentation rate, lactate dehydrogenase and C-reactive protein which are seen in our patient (Table 1). These levels are directly proportional to the clinical outcome and mortality. Procalcitonin levels are normal unless there is a concomitant bacterial infection [1,6,7,11].

Currently, there are no reports elucidating the direct relationship of COVID-19 and its influence on stroke outcome. Possible mechanisms that may explain acute ischemic events in COVID-19 patients include cardiovascular compromise in the setting of infection, reduced oxygenation in the setting of acute respiratory distress syndrome, and systemic inflammation causing thrombosis

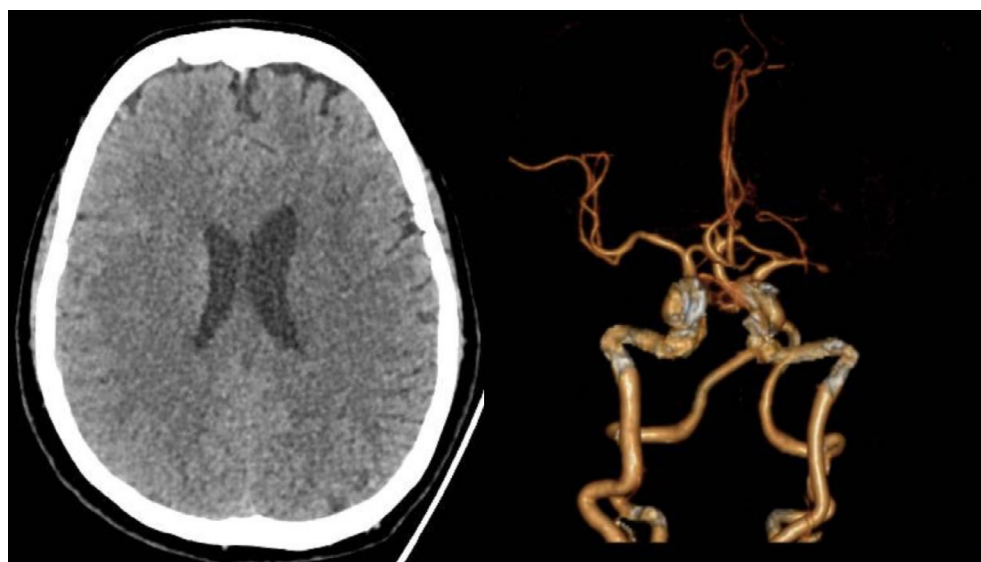


Fig. 1. (A) Plain cranial CT scan shows subtle hypodensity on the Left Corona radiata and Centrum Semiovale denoting acute infarction. (B) CT angiography shows atherosclerotic intracranial arteries with significant stenosis at the M1 segment of the MCA.

Table 1
Laboratory and Imaging Results of the patient.

TEST	SCORE	Reference range
WBC	13,200	4800–10,800 mm ³
Lymphocyte count	11%	19–48%
Platelet count	409,000	150,000–400,000/mm ³
Creatinine	0.69	0.55–1.02 mg/dL
Lactate Dehydrogenase	406	85–227 U/L
Highly-sensitive cardiac troponin I	14.5	<11 ng/dL
Prothrombin time	12.9	11.9–14.2 s
CRP	192	<6 mg/dL
ESR	86	0–30 mm/hr
Procalcitonin	0.80	<0.5 ng/ml – low risk for sepsis >2.0 ng/ml – High risk for severe sepsis or septic shock
D-Dimer	1160	0–246 ng/ml
Serum ferritin	4609.33	4.63–204 ng/ml
Albumin	2.3	g/dL
ALT	34	14–59 U/L
AST	25	15–37 U/L
Imaging features		
Consolidation	Present	
Ground-glass opacity	Present	
Bilateral pulmonary infiltration	Present	

or plaque disruption. This patient had a coexisting cerebral vascular disease that may have an impact on the outcome of immediate treatment of stroke. Together with antithrombotics, the balance in hemodynamic status is paramount in treating such patients pre- and post-thrombolysis. Fluid management therefore remains a challenge among stroke patients who are COVID-19 positive as acute respiratory distress syndrome is a known potential sequelae, especially in those with multiple comorbidities. This reported case had severe stenosis in the left M1 segment of the middle cerebral artery which would make thrombolysis a better option as we anticipate the multisystemic problems that COVID patients are faced with. To mention, myocarditis, the second common mentioned cause of fatality next to severe lung infection may exacerbate heart failure. Vice versa, acute heart failure should also be evaluated for myocarditis as a primary complication of COVID-19 [9]. Whether this is secondary to viral infiltration, or hypoxia and cytokine storm mounting in response to systemic infection [13], the aggressiveness in stroke management remains a priority because stroke is reversible.

Given the current setting however, management of stroke among COVID-19 positive patients is a struggle in most countries due to hindrance from rapid response of the stroke team. This is likely from extrinsic factors such as inadequate Personal Protective Equipment (PPE) as well as lack of imaging modalities solely dedicated for COVID-19 patients to avoid rapid viral transmission. These occur on top of the already existing problem of shortage of healthcare professionals as they are inadvertently exposed and hence, quarantined. Multiple reports of cases will help explore other possibilities of a causal relationship or none, and define guidelines in the management of stroke among COVID-19 positive cases.

4. Conclusion

The management of COVID-19 patients who suffer from stroke poses a challenge to healthcare professionals. There are no specific clinical guidelines established in handling COVID-19 positive

patients who are eligible for thrombolysis. Management of hemodynamic status must always balance the risk and benefits of such treatment in COVID positive cases. There is no direct causal relationship of stroke with COVID-19 as of yet but given the fact that COVID-19 patients are predisposed to developing neurologic complications such as acute vascular events, monitoring these complications in the setting of COVID-19 infection is highly warranted. We therefore propose the following: 1) Development of an Acute Stroke Unit capable of managing COVID-19 patients and 2) Establishment of a clinical pathway and guidelines for the management of these complications in COVID-19 patients.

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