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Patients with Hypercoagulability and Cerebral Infarction Caused by Covid-19

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Abstract

Corona Virus Disease 19 (COVID-19) plague is a deadly disease that gets the world's attention, also in Indonesia. The death cases report shows a high number with a sum of more than 95.723 in August 2021 and predicted the case will increase. The virus can cause cerebral edema which penetrates the brain through the olfactory epithelium and induces Cytokine Storm Syndrome (CSS) which can cause interference with the Blood-Brain Barrier (BBB) resulting in hypoxia and coagulopathy. This study used a case study approach with detail testing towards one event. In this case, cerebral infarction caused by COVID-19 was proven by laboratory results with symptoms of inflammation, CSF, sepsis, and coagulopathy. These symptoms can lead to cerebral infarction and hypercoagulability. Treatment interventions are carried out to reduce inflammation and cerebral edema and prevent secondary infection. COVID-19, in this case, is considered to have a deleterious effect on cerebral infarction patients. Proper treatments are needed to give better results.

Keywords: *Corona Virus Disease 19 (COVID-19), Hypercoagulability, cerebral infarction*

Introduction

Coronavirus disease 2019 (COVID-19) is a disease that is caused by virus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that get massive world's attention and cause death in society (Ahmad & Rathore, 2020; Ellul, et.al., 2020), Indonesia is no exception.

The world is currently facing a pandemic caused by SARS-CoV-2 (Coronavirus) and its infection called COVID-19. This viral infection was first discovered in Wuhan, China in December 2019 and has spread rapidly to various parts of the world. This pandemic affects various changes in the socio-economic sector of all affected regions, not only China. Based on data released by the COVID-19 Task Force, COVID - 19 has infected around 3.44 million people in Indonesia with a death toll of 95,723 people and luckily about 2.81 million people have been declared cured in Indonesia (Covid Task Force, 2021).

This pandemic has given negative impacts on every aspect of people's lives, including the economy, education, health, psychology, and all aspects of human life (WHO, 2020). Current evidence shows that COVID-19 is spread between people through direct and indirect interaction (through contaminated objects or surfaces), or by close contact with an infected person through oral and nasal secretions. These secretions include saliva, respiratory secretions, or droplet secretions. These secretions are released from people's mouths or noses who get infected when they cough, sneeze, talk, or sing (Ahmad & Rathore, 2020; Wang, Wang, Ye, & Liu, 2020). Their study revealed that this epidemic can cause cerebral edema that penetrates the brain through the olfactory epithelium and induces Cytokine Storm Syndrome (CSS) thereby disrupting the Blood-Brain Barrier (BBB), which results in hypoxia and coagulopathy (Ahmad & Rathore, 2020; Chen, et al., 2020; Nordvig, et al., 2020).

Neither the WHO nor any health authorities have agreed that dizziness is a typical Covid-19 symptom like fever, dry cough, or loss of smell (Chen et al., 2020; Whittaker, Anson, & Harky, 2020). Previous case reports about the COVID-19 pandemic have reported that COVID-19 patients may develop acute cerebral infarction because of large vessel occlusion or massive intracerebral hemorrhage without a history of arterial hypertension or previous use of anticoagulants. Clinical manifestations that can be observed in patients with COVID-19 are neurological symptoms including the central nervous system (dizziness, impaired consciousness, acute cerebrovascular disease, and epilepsy), and the peripheral nervous system (olfactory disturbances, taste disturbances, visual disturbances, and neuralgia) (Baig, 2020; Mao L, et al., 2020).

Method

This study employs a qualitative approach with a case study method. In qualitative research, there are several types of research approaches. The case study research method is used to obtain accurate information to answer the research problems in detail and accurately (Creswell, 2013). The research data are the results of observations, documents, and interviews with a patient with Cerebral Infarction because of Covid-19. Researchers take some essences from 90% of the data or various information, then serve as findings.

Findings and Discussion

A 70-year-old man came to the hospital with a weak physical condition a day before he came to the hospital. Six days before he came to the hospital, the old man attended his family's funeral. The person who was buried was infected by the covid – 19 viruses. Three days after he visited the funeral, he got a fever, headache, decreased appetite, and stive. After intensively checked, the vital sign showed as follows 210/107 (blood pressure), 100 (pulse), 10 (breathing rate), and 37 (temperature). Physical examination results reported a decrease in Glasgow Coma Scale (GCS) with global aphasia (E4M5Vx). The patient did not show neck stiffness, left center facial palsy, and positive Babinski's sign. The CT scan of the head shows a brain infarction in the right hemisphere as shown below:

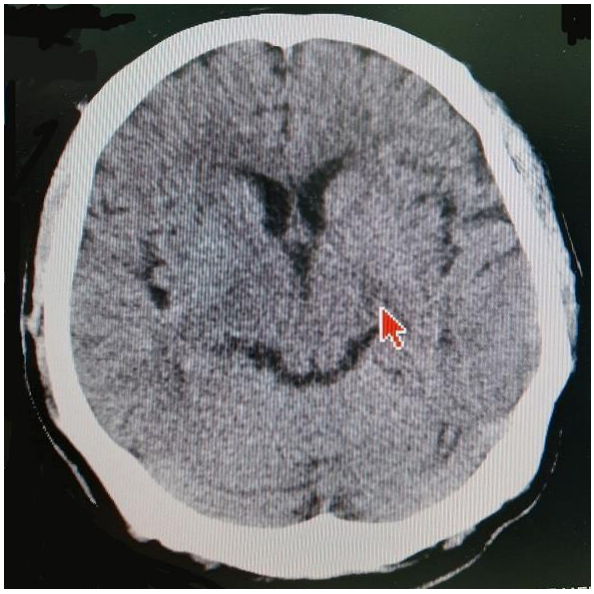

Figure 1. Non-contrast head CT-scan shows cerebral infarction in posterior limb of the left internal capsule (red arrow)

Laboratory test results found leukocytosis (13400 / L), positive SARS-CoV-2 IgM antibody, and positive SARS-CoV-2 IgG antibody. The chest CT scan also showed atypical bilateral pneumonia with bilateral pleural effusions as seen below:

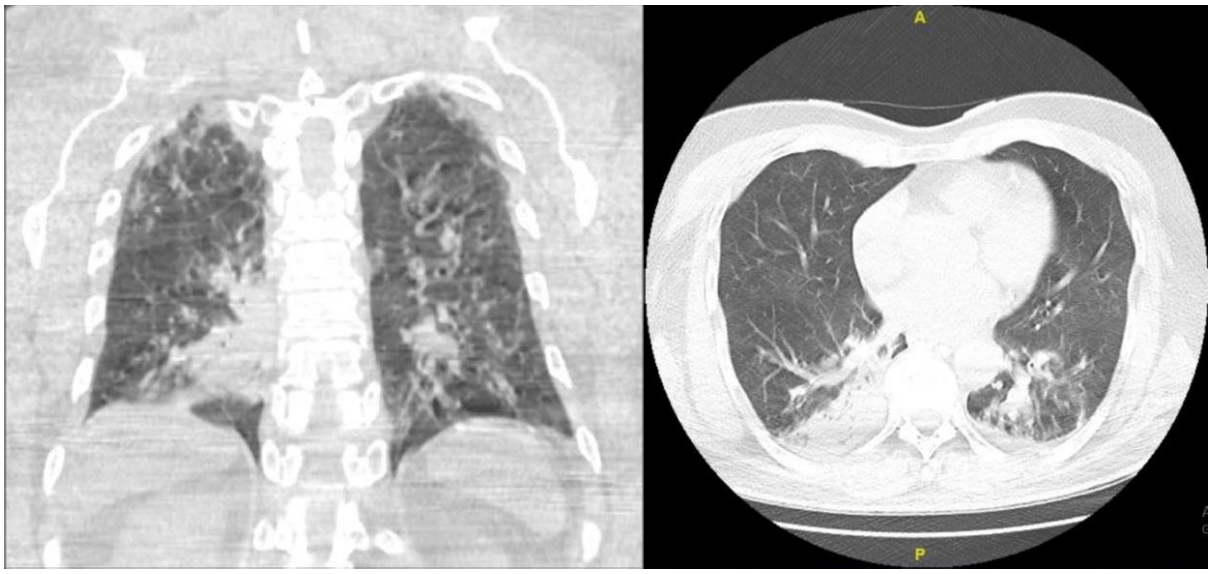

Figure 2. Non-contrast chest CT-scan shows atypical bilateral pneumonia with bilateral pleural effusion

The patient was initially treated with citicoline, clopidogrel, aspirin, azithromycin, acetaminophen, ceftriaxone, zinc, vitamin B, and vitamin C. The condition of the patient on the first day was worsened after the examination. The patient decreased his level of consciousness, along with fever and convulsions. Blood pressure was 196/137 with a temperature of 38,5. GCS decrease to E1M2V1 and neck stiffness. Hypertonicity was observed in all extremities. Laboratory tests showed leukocytosis (18700 / µL), the increasing of D-dimer (11,8 µg / mL), increase in lactate (4,0 mmol / L), increase in ferritin (<1200 ng / mL), increase in protein C quantitative reactive (308,2 mg / L), increase in procalcitonin (4,82 ng / mL), and respiratory alkalosis (pH 7,542). Polymerase Chain Reaction (PCR) from the nasopharyngeal swab produces positive (Cycle threshold (Ct) 38.62). Aspilet and clopidogrel were discontinued, and treatment for meningitis was started. Ampicillin, dexamethasone, phenytoin, and levofloxacin are added to the regimen. On the fifth day, patients were given amlodipine and telmisartan, while phenytoin was replaced with levetiracetam.

After six days of intensive treatment, the condition of the patient became better. The patient could have spontaneity open his eyes and follow the doctor's instructions, however, he had still trouble talking because days before he lost his consciousness. The patient did not feel headache anymore, the fever decreased, and asphyxiate was lost. However, his blood pressure decreased to 152/102 with GCS E4M6V4. He still felt stiff neck. On the tenth day, the patient was fully conscious (GCS E4M6V5) and was moved from the COVID-19 special intensive care unit to the neurology high care unit, after that he was moved to the general neurology ward and finally sent home.

The brain infarcts discussed in this study can be associated with the COVID-19 outbreak, which is transmitted through direct contact with other individuals through droplets of saliva from patients infected with the outbreak. At first, the patient contracted the COVID-19 outbreak as evidenced by the results of serological tests (positive for SARS-CoV-2 IgM and IgG antibodies). Patients diagnosed with COVID-19 are known through their PCR test results (positive from a nasopharyngeal swab).

Gullian et al., (2020) reported that cases of simultaneous cerebral infarction were found in several arterial areas in COVID-19 patients, with symptoms of increased white blood cell counts, fibrinogen, D-dimer, lactate dehydrogenase, CRP, and ferritin. Brain Magnetic Resonance Image (MRI) showing an ischemic lesion involving the posterior cerebral artery (PCA), and superior cerebellar artery (SCA), middle cerebral artery (MCA). A patient who was involved in this study reported similar laboratory findings (leukocytosis, elevated ferritin levels, lactate), and elevated CRP levels, which indicate inflammation, particularly CSF.

Manolis et al., (2020) stated that D-dimer was proposed as an important key in clinical practice. Then viral coagulopathy involves macrovascular and microvascular structures, hypercoagulable states, thrombosis/thromboembolism, and impaired fibrinolysis. D-dimer of the patient in this study was raising.

Procalcitonin (an indicator of sepsis) also showed an increase, and it was suspected to be the cause of worsening the patient's condition.

All the factors described above can lead to hypercoagulability and cerebral infarction. The therapeutic regimen was immediately changed to a meningitis regimen to prevent secondary infection, reduce cerebral edema, and decrease inflammation. MRI and spinal tap were not performed in this study because of the procedure's limitations and tools. Also, it was influenced by the patient's health condition. On the first day, the patient's condition was worse, then began to get better after 7 days of treatment and was finally allowed to go home on day 20 with a minimal deficit. This condition gets better because of a reduction in the inflammatory process.

Conclusion

Cerebral infarction which caused by COVID-19 was proven by laboratory results. This was proven by the presence of symptoms of inflammation, CSF, sepsis, and coagulopathy. The symptoms are able to result cerebral infarction and hypercoagulability. Treatment interventions were performed to reduce inflammation, decrease cerebral edema, and prevent secondary infection. Proper treatment is needed to give better results.

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