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Hypertriglyceridemia in a COVID-19 Patient: A Case Report

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ABSTRACT

Most laboratory findings of coronavirus disease (COVID-19) are not specific nor are they reliable in assessing response to treatments. This case report outlines a rare finding of severe hypertriglyceridemia in a COVID-19 patient and, more interestingly, it sheds light on a correlation between clinical improvement and a decrease in hypertriglyceridemia after plasmapheresis treatment. Using a normal triglyceride level as a target for our plasmapheresis treatment resulted in dramatic improvement in our patient's condition. The patient was treated successfully and discharged from the hospital after nine days.

Keywords: SARS-CoV-2, COVID-19, Hypertriglyceridemia

INTRODUCTION

Coronavirus disease (COVID-19) pandemic is a global phenomenon that changed our understanding and practice everywhere. It has been documented to cause a myriad of clinical syndromes and is claimed to be responsible for unusual clinical symptoms and signs. The most common presentation is respiratory symptom. Other common presentation includes sepsis and multiple organ failure. [1-3] Until now, the only association between COVID-19 and hyper-triglyceridemia has been the use of tocilizumab. [4,5] However, dyslipidemia has also been documented.[6] This is our documentation of a rare case of a COVID-19 patient presenting with severe hypertriglyceridemia and his response to plasmapheresis.

CASE PRESENTATION

A 37-year-old Asian man with no known comorbidities was admitted to our department complaining of fever (38.5°C), severe chest pain, persistent dry cough, myalgia, and shortness of breath. The patient had no history of chronic disease. Physical examination revealed bilateral coarse crepitation over his chest and decreased basal breathing sounds. He was fully conscious with no other signs and required 15 LPM of oxygen with a non-rebreathing mask to maintain a reading of peripheral oxygen above 92%. A chest radiograph showed extensive bilateral interstitial infiltrate. [image1]. When nurses obtained a blood sample, they observed that his blood appeared milky [image 2]. Laboratory findings revealed triglycerides at 9475 mg/dL (normal: <150mg/dl), total leukocytosis at $14.6\times10^3/\mu L$, with lymphopenia at $0.77\times10^3/\mu L$, and lactate dehydrogenase at 1015.7 units/L (normal: 100-190 units/L). Nasopharyngeal swabs confirmed COVID-19 by real-time polymerase chain reaction (RT-PCR) assays. [7-9]

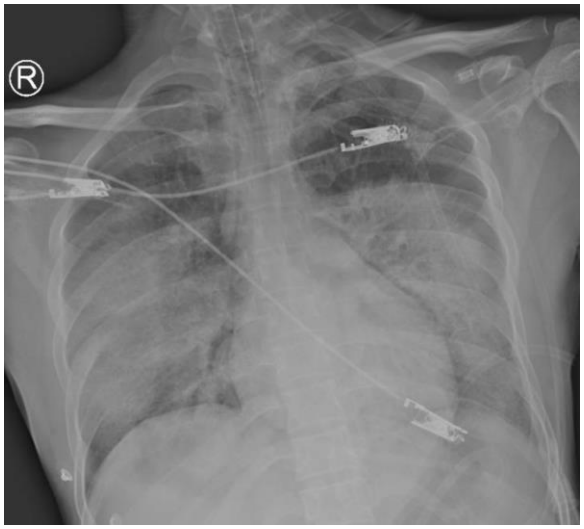

Figure 1. Chest radiograph showing bilateral interstitial infiltration.

Figure 2. Patient's blood sample, which is milky in appearance.

Clinical examination was performed to check for any musculoskeletal manifestations of chronic hyperlipidemia; we searched for eruptive xanthomas, tendon Achilles tendinitis, lipemia retinalis, we asked about any history of oligoarthritis before, there were none.[18] The patient denied any family history of hyperlipidemia or any previous admission, he was not on any chronic medications, doesn't consume alcohol and had no previous lipid profile done for him. There was no abdominal pain or tenderness; serum lipase and amylase levels were normal.

His oxygen requirement continued to increase with progressing tachypnea; thus, we decided to intubate him and continue our COVID-19 management. He required a 40% FiO_2 level. After discussing the case with our haematologist team, we decided to start plasmapheresis according to our protocol for management of severe hypertriglyceridemia. After the second day, his triglyceride level had lowered to 247.7 mg/dL. His FiO_2 level was 25%. On the fifth day, he was successfully weaned from the mechanical ventilator and extubated. Four days later, he was shifted to the ward and examined by the medical team thereafter. He was discharged home five days later with a normal lipid profile; his triglyceride level was 128 mg/dl and unremarkable lab results.

DISCUSSION

Infection induces immunological reaction that result in dysregulation in lipid metabolism. Usually, inflammation leads to accelerated hepatic fatty acid synthesis, which when combined with inhibited fatty acid oxidation and accelerated very low-density lipoprotein (VLDL) secretion leads to higher plasma triglyceride level. Severity of infection has inverse relationship with VLDL clearance due to decreased lipoprotein lipase and apolipoprotein E. Hypertriglyceridemia is a characteristic change of lipoprotein metabolism during inflammation.[10] This has been observed in infections with gram-negative bacteria and HIV infection and AIDS.[11] Furthermore, increase in hepatic lipogenesis and the suppression of triglyceride clearance are associated with interferon (IFN)-α levels. [12,13]

In addition to that, Hypertriglyceridemia is an activator of the NLRP3 inflammasome, triggering systemic inflammatory state that mediate SARS-CoV-2 infection. It could potentiate or accelerate the pre-existing (SIRS) systemic inflammatory state of individuals with obesity, via the NLRP3 inflammasome activation and the release of pro-inflammatory cytokines from cells through Gasdermin-pores [24]

Certain studies have also discussed how angiopoietin-like protein 4, an inhibitor of lipoprotein lipase activity, plays an important role in lipid metabolism through inhibition of triglyceride rich lipoproteins metabolism when its concentration enhanced during inflammation.[14] This could contribute to the pro-atherogenic changes during severe inflammation. Liping Wang et al [25] found the faster transition of +ve COVID nucleic acid test is correlated to higher serum triglyceride level which is related to more expression of ACE2 protein for SARS-CoV-2. while serum triglyceride level is an important influencing factor for the CoV-2 patient's recovery, triglyceride lowering modalities can be treatment of COVID-19 and promote the recovery of COVID-19 patients. Not only that, Increased TG/HDL-C ratio is independent factor associated with myocardial injury, heart failure, severity, and mortality in patients with COVID-19, and promising marker for early identification of patients with high risk and poor outcome [26]

So, Evidence confirms that the dysfunctional inflammatory response contributes heavily in the presentation and manifestation of COVID-19 symptoms,[15] leading to life threatening ARDS, cytokine storm syndrome and eventually multi-organ failure. [19,20] Previous studies that concentrated on the immunological aspect of the disease found that the most severe cases which required critical care admission have higher plasma levels of IL-2, IL-7, IL-10, macrophage inflammatory protein 1α (MIP1α), granulocyte colony-stimulating factor (G-CSF) and TNF.[16,17] These factors could contribute to higher than normal triglyceride levels. The possible benefits of plasmapheresis in this kind of a situation are removal of toxins and proinflammatory cytokines which has the ability to ignite cytokine storm mediated immune injury of multiple organs. [21] This translates into clinical therapeutic effect and reported previously following the completion of 5 cycles (7 days) [22,23]. However, in our case we did not follow the 5-cycle protocol; instead, our target was to normalize triglyceride levels, which was achieved after 3 cycles and coincided with remarkable clinical improvement.

Thereby we suggest the presence of an association between cytokine storm syndrome and hypertriglyceridemia, and we propose using the lipid profile in such cases as a parameter to decide whether plasma exchange sessions need to be continued instead of using the 5-cycle protocol. Of course, additional investigation is needed to confirm such a proposal as underlying lipid disorder is possible in this patient. However, using a normal triglyceride levels as a target for our plasmapheresis treatment resulted in dramatic improvement in our patient's condition. This needed to be documented and, more importantly, should let us revisit the topic of dyslipidemia in COVID-19 induced cytokine storm and whether to use the lipid profile as a monitor of ascension or resolution of infection.

Declaration of Conflicting Interest: No conflict of interest.

Ethical Approval

As this case was in king Saudi medical city in Riyadh Saudi Arabia, it was approved by Research & Innovation Centre/ Institutional Review Board of King Saud Medical City. All the paper works presented including written informed consent from the patient.

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