



Chylothorax found in a patient with COVID-19

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Abstract

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and its clinical spectrum ranges from mild to moderate or severe illness. A 78-year-old male was presented at emergency department with dyspnoea, dry cough and severe asthenia. The nasopharyngeal swab by real-time polymerase chain reaction confirmed a SARS-CoV-2 infection. The x-ray and the thoracic ultrasound revealed right pleural effusion. A diagnostic-therapeutic thoracentesis drained fluid identified as chylothorax. Subsequently, the patient underwent a chest computed tomography which showed the radiological hallmarks of COVID-19 and in the following weeks he underwent a chest magnetic resonance imaging to obtain a better view of mediastinal and lymphatic structures, which showed a partial thrombosis affecting the origin of superior vena cava and the distal tract of the right subclavian vein. For this reason, anticoagulant therapy was optimized and in the following weeks the patient was discharged for clinical and radiological improvement. This case demonstrates chylothorax as a possible and uncommon complication of COVID-19.

KEYWORDS

chylothorax, COVID-19, lymphatic system, thoracentesis, thrombosis

INTRODUCTION

First reported in Wuhan, China,¹ the new coronavirus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has spread rapidly worldwide, causing millions of deaths and putting a lot of strain on healthcare systems. Many studies have analysed the clinical features of SARS-CoV-2 infection, which can result in a spectrum of symptoms, ranging from mild to severe respiratory failure, as well as life-threatening pneumonia and multi-organ failure. This virus penetrates the host cells via the angiotensin-converting enzyme 2 (ACE2) receptor,² which is particularly expressed in the lower respiratory tract, but can also be found in various human anatomical locations. The complexity and unpredictable course of coronavirus disease 2019 (COVID-19) have been a tough challenge to clinicians who have often

struggled to find a universally valid treatment protocol, first and foremost due to uncommon manifestations with no clear pathophysiological explanation.

CASE REPORT

We report the case of a 78-year-old Italian male patient, who was admitted in March 2020, to the accident and emergency department with a 7-day history of increasing dyspnoea [modified Medical Research Council (mMRC) 3], dry cough, fevers, headaches and severe asthenia. The patient, a former smoker, had a medical history for chronic obstructive pulmonary disease in triple inhaled therapy (Global initiative for chronic Obstructive Lung Disease [GOLD] 3) and gastroesophageal reflux disease. His physical examination revealed shortness of breath with oxygen saturation of 95% on room air, respiratory rate of 25 breaths per minute, heart

Francesco Satriano and Giulia Scioscia are co-first authors.

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rate of 85 beats per minute, blood pressure of 140/80 mmHg and apyrexia. Auscultation of the lungs revealed absent breath sounds in right mid-basal side and fine basal teleinspiratory crackles on the left side. A SARS-CoV-2 polymerase chain reaction carried out with a nasopharyngeal swab tested positive. Blood tests revealed a normal range in terms of total white blood cell count (7.2×10^9 G/L), lymphocyte count (2.05×10^9 G/L) and an increase of C-reactive protein (44 mg/dl) and D-dimer (1383 ng/ml). A point-of-care ultrasonography (POCUS) and an urgent chest x-ray (CXR) showed right pleural effusion with bilateral thickened pulmonary interstitial structures. Thus, the patient was admitted to the Department of Respiratory Diseases and, in the following days, he underwent a diagnostic-therapeutic thoracentesis. About 1750 ml of fluid was drained and the chemical-physical examination showed an increase in the concentration of triglyceride (854 mg/dl) and the presence of chylomicrons. As a result of this evidence, chylothorax was diagnosed. Therefore, the patient began a specific protein/electrolyte-rich and low-fat diet. On the seventh day of hospitalization, the patient underwent a contrast-enhanced chest computed tomography (CT) which showed a persistent right pleural effusion, bilateral and multilobar ground-glass opacities (GGOs) with peripheral and posterior distribution, diffuse interstitial involvement and no evidence of pulmonary embolism, pulmonary or mediastinal heteroformations (Figure 1), while ectasia of the tortuous azygos was observed at the level of the superior vena cava (SVC) outlet (Figure 2). The patient's clinical status deteriorated with the onset of type 1 respiratory failure, which was treated with oxygen therapy. A repeat POCUS showed an increase in pleural effusion for which he underwent a second thoracentesis, with evacuation of about 1000 ml of rosy-milky liquid. On the 18th day of admission, in order to characterize and explore, in an accurate manner, the possible presence of any mediastinic or thoracic duct alterations, the patient underwent a contrast-enhanced chest magnetic resonance imaging, which showed a partial thrombosis affecting the origin of the



FIGURE 1 Chest computed tomography scan showing a bilateral ground-glass opacities, diffuse interstitial involvement and the presence of right pleural effusion, which was diagnosed as a chylothorax

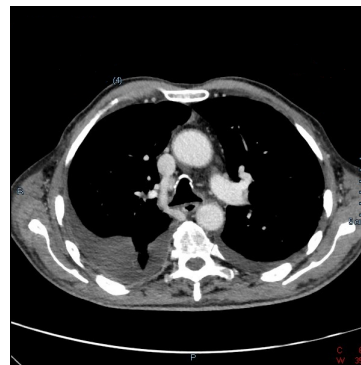


FIGURE 2 Ectasia of the azygos vein at the level of the superior vena cava outlet

SVC and the distal tract of the right subclavian vein and a normal thoracic lymphatic duct. For these reasons, the prophylactic anticoagulant therapy, already started at hospital admission in addition to an early mobilization, was optimized switching from enoxaparin sodium 6000 IU once a day to 6000 IU twice a day. In the following weeks, the patient underwent a subsequent CT angiography of the chest which revealed a partial resolution of pre-existing GGOs, a resolution of thrombosis and kneeling of the right subclavian vein along the axillary course. Upon hospital discharge, the patient underwent a POCUS, which showed an important reduction in pleural effusion. Following the gradual and progressive clinical and blood gas analytical improvement, the patient was discharged, with the advice to attend regular pneumological follow-up. One month after hospital discharge, we have scheduled a regular follow-up check, in which we performed a CXR for evaluation of the pleural effusion, which had completely disappeared.

DISCUSSION

This case report shows a patient with COVID-19 pneumonia complicated by the onset of chylothorax. Chylothorax is a rare condition that results from the thoracic duct damage with chyle leakage from the lymphatic system into the pleural space, usually on the right side. Diagnosis involves cholesterol and triglyceride measurement in the pleural fluid. Chyle through the lymphatic system, characterized by a system of one-way valves, is conducted towards the venous circulation. Chylothorax can be classified into two categories namely traumatic or non-traumatic.³ The aetiology of the non-traumatic category include malignancy, sarcoidosis, retrosternal goitre, amyloidosis, SVC thrombosis, benign tumours, congenital duct abnormalities and diseases of the lymph vessels such as yellow nail syndrome, lymphangioleiomyomatosis (LAM) and haemangiomatosis.⁴ In addition, mediastinal lymphadenopathy may compress the lymphatic vessels preventing drainage of the lymph, resulting in extravasation of chyle into the pleural space.³

To date, few reports on chylothorax have been detected in COVID-19 patients. The infection by SARS-CoV-2 causes

a cytokine storm with consequent hyper-inflammation and an arterial and venous vasculopathy associated with a pro-thrombotic state. Based on this background, our case report testifies the systemic and unpredictable evolution of the disease and the involvement of the lymphatic system. Probably, these phenomena are secondary to endothelial damage to the venous circulation due to thrombosis. Indeed, the formation of thrombi at the origin of the SVC could have resulted in impaired lymphatic drainage. Another probable hypothesis is that the pre-existing altered course of the right subclavian vein has been further compromised by a diffused prothrombotic state. Also, we found no evidence to support the pre-existence of the SVC thrombosis and chylothorax. Indeed, before the index admission, the patient was in good general health and was asymptomatic and there were no signs of loss of chyle or nutritional deficiency. However, more research is needed to better characterize the pathogenesis of the disease.

CONFLICT OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

All authors have made substantial contributions in the conception and design of the work, in drafting the article, in revising it critically and in the final approval of the version to be submitted.

ETHICS STATEMENT

Appropriate written informed consent was obtained for publication of this case report and accompanying images.

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