Received: 15 September 2020 | Revised: 6 December 2020 | Accepted: 8 December 2020

DOI: 10.1002/ccr3.3709

CASE REPORT

Clinical Case Reports Open Access WILEY

Pulmonary embolism in pregnancy with COVID-19 infection: A case report

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Abstract

Pregnant women in the third trimester are at the highest risk. Contracting COVID-19 increases the complications. Hence, it is critical for pregnant women, especially during the third trimester, with slightest COVID-19 symptoms to visit as soon as possible. Early diagnosis considerably contributes to saving both the mother and the fetus.

KEYWORDS

case report, coagulopathy, COVID-19, pregnancy, pulmonary embolism, thrombosis

1 | INTRODUCTION

Coronavirus can lead to overcoagulation, blood stasis, and endothelial damage resulting in thromboembolic disorders. We report a 22-year-old pregnant woman with coronavirus admitted due to the pulmonary emboli. This case highlights the importance of considering a new category for COVID-19 pregnant patients with venous and arterial thromboembolic disorders.

Ever since the first case of coronavirus disease 2019 (COVID-19) in Wuhan, China, the world has been struggling to overcome this crisis. The rapid spread of the underlying severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) around the world, and its various complications imposed on the human body (which are not completely understood yet), has made the World Health Organization (WHO) declare a pandemic on 11 March 2020. Common symptoms of COVID-19 include but are not limited to dry cough, chest pain, shortness of breath, dyspnea, pneumonia, fever, fatigue, and in some cases death.[1-4] In addition to respiratory symptoms, COVID-19 can cause multi-organ disorders, the mechanism of which includes the release of inflammatory cytokines that stimulate tissue factor production and active thrombin and may lead to thromboembolic complications.[5-7] Anticoagulant treatments are recommended for nonpregnant COVID-19 patients.[8]

Pregnant patients who are diagnosed with COVID-19 and show severe symptoms have a higher risk of thromboembolic disorders and can be treated with prophylactic weight-adjusted doses of heparin.[9] The aim of this case report was

to show that like common causes for venous thrombosis, embolism, and DIC in pregnancy, COVID-19 can present with pulmonary embolism in pregnant patients. Hence, for a pregnant woman with pulmonary thromboembolic symptoms, an important differential diagnosis is COVID-19.

2 | CASE PRESENTATION

On 22 April 2020, a 22-year-old pregnant woman with no past medical history and one-time previous vaginal delivery (gravida 2, para 1, live 1), with a gestational age of 30 weeks and 5 days, was admitted to the emergency ward at Firoozgar Hospital, Tehran, Iran, due to the loss of consciousness and double mydriasis. According to the patient's husband, the patient has shown tonic-clonic seizure at home followed by loss of consciousness. Six days before admission, the patient had presented shortness of breath for several days what she consumed inhaled opioids, which she declared that she did not have an addiction before.

In the emergency room, the patient was intubated due to the loss of consciousness and a low score on the Glasgow Coma Scale. Cardiopulmonary resuscitation (CPR) was performed on her. The fetal heartbeat was not detected. After consulting with the anesthesiologist and the cardiologist, the patient was then quickly transferred to the operation room for monitoring and possible cesarean delivery. Because of the unstable condition of the patient, eight rounds of CPR were administrated. The CPR on the patient was performed with 2 doses of atropine (2 mg intravenously), 2 vials of calcium gluconate, 5 vials of sodium bicarbonate, and 10 intravenous vials of epinephrine (1 mg every 3 minutes) as a catecholamine. Emergency echocardiography in the operating room was performed, which showed a very dilated right atria and ventricle, leading to the full pressure of the intercostal wall on the left ventricle. The pulmonary artery pressure was measured to be 50 (systolic blood pressure was not detected with cuff) and ejection fraction (EF) was 30%, resulting in a diagnosis of a massive pulmonary embolism and the right- and left-sided heart failure. An intravenous single dose (100 mg) alteplase was immediately infused due to the critical condition of the mother with the very low EF, and the fetal death in the mother's uterus was confirmed with ultrasound. In consultation with a cardiologist, they offered to do embolectomy, but it was not possible at this center. Also, the patient was not at a stable stage to be transferred to another place. So, alteplase was started as an antithrombin and not as a natural coagulant.

The patient was transferred to the intensive care unit (ICU) when she became stable. The second echocardiography was performed. The additional echocardiography results are as follows: right ventricle enlargement, severe dysfunction McConnell's sign, moderate tricuspid regurgitation and no tricuspid stenosis, systolic pulmonary pressure (sPAP) of 35, dilated pulmonary artery, mild pulmonary insufficiency and no pulmonic stenosis, no aortic insufficiency and aortic stenosis, no mitral regurgitation and mitral stenosis, dilated inferior vena cava, and normal left ventricle size. She was treated with 3 mg of midazolam injection (intravenously if necessary), 500 mg of levetiracetam (intravenously twice a day), 1 g intravenous injection of cefepime twice a day, 25 μg of fentanyl injection (intravenously as needed), daily intravenous injection of 40 mg pantoprazole, 40 μg/min of norepinephrine infusions, 3-5 μg/hr of midazolam infusions, 25-50 μg/hr of fentanyl infusions, and one intravenous vial of bicarbonate for pH levels lower than 7.2. **Table 1** shows the results of the laboratory reports, which confirmed that the patient was tested positive for COVID-19. Chest X-ray also confirmed the same diagnosis, which demonstrated diffuse consolidative opacities in both lungs with the left side being predominant **(Figure 1)**.

The pregnancy was terminated prematurely due to not detecting the fetal heartbeat and saving the mother's life. The extra-amniotic saline infusion (EASI) was installed to end the pregnancy, the dilation was 5 cm while it was removed, and the patient expired before delivery. During ICU admission, despite receiving norepinephrine infusions, the patient's blood pressure was very low (70/40) with the clubbed vascular resulting in putting a central venous line on her femur with extreme difficulty. The patient expired due to respiratory-cardiovascular arrest and unsuccessful cardiopulmonary resuscitation on 23 April 2020.

3 | DISCUSSION

COVID-19, which initially presents with symptoms of respiratory illness, may lead to dysfunction of a single organ or multiple organs and even death. In nonpregnant patients admitted to the ICU with COVID-19 pneumonia, the prevalence of venous and arterial thromboembolic disorders is reported to be about 25% to 31%.[10,11]

A recent study considered a new category for COVID-19 patients with venous and arterial thromboembolic disorders (named as COVID-19–associated coagulopathy) and compared it to other thromboembolic disorders such as disseminated intravascular coagulation, hemophagocytic syndrome, antiphospholipid syndrome, thrombotic microangiopathy, thrombotic thrombocytopenic purpura, and heparin-induced thrombocytopenia.[12] Our patient had some parameters of COVID-19–associated coagulopathy such as high PTT, fibrinogen, and D-dimer levels. Higher D-dimer levels (more than 0.5 μg/mL) are considered as an indirect indicator for increased thrombin production and are associated with an increased risk of death.[13,14] Anticoagulant therapy with low molecular weight heparin

TABLE 1 Patient laboratory data

Date	22 April 2020	23 April 2020	23 April 2020	22 April 2020
Time	10:40	9:40	00:00	16:55
WBC (per mm^3)	10.8	26.8	12.5	19
Lymphocyte	60.3	9.6	20.5	32.8
RBC (per μm^3)	3.47	3.15	3.55	3.63
Hb (g/dl)	10.5	9.5	11.1	11.2
Hct (%)	33.9	29.1	33.5	34.6
MCV (fL)	97.7	92.4	94.4	95.3
MCH (Pgm)	30.3	30.2	31.3	30.9
MCHC (gr/dL)	31	32.6	33.1	32.4
Platelet count (per mm^3) [a]	187	103	141	158
PT (Sec)	18/6	69.1	NA	max
PTT (Sec) [b]	46	82	NA	132
INR	1.4	5.6	NA	NA
Antiphospholipid antibody	Negative	NA	NA	NA
Anticardiolipin antibody	Negative	NA	NA	NA
Lupus anticoagulant	Negative	NA	NA	NA
pH	6.4	7.05	7.03	6.6
pCO_2 (mm Hg)	172	41	42.7	211.6
BE (mmol/l)	-34	-18.6	19.2	-21.9
HCO_3 (mmol/l)	15.1	11.5	11	40.8
pO_2 (mm Hg)	18.8	39	55.9	51.3
BUN (mg/dl)	45	111	NA	59
Creatinine (mg/dl)	1.4	3.6	NA	1.6
Na	140	139	NA	140
K	4.4	5.3	NA	4.7
Ca	8.4	NA	NA	NA
Mg	NA	2.2	NA	NA
P	NA	6	NA	NA
Urine analysis	Normal	NA	NA	NA
Urine culture	No growth	NA	NA	NA
Blood culture	Staphylococci epidermidis	NA	NA	NA
SGOT(IU/L)	2829	2000	NA	2200
SGPT(IU/L)	2637	2058	NA	2100
Alk-P	939	1218	NA	1038
Bilirubin—total	NA	2.4	NA	1.4
Bilirubin—direct	NA	1.2	NA	0.6
CPK	2184	NA	NA	NA
LDH (per ml)	6240	NA	NA	NA
Beta-2 microglobulin (µg/ml)	NA	10.5	NA	NA
HBSAg antibody	Negative	NA	NA	NA
HIV antibody	Negative	NA	NA	NA
D-dimer	+3	NA	NA	NA
Fibrinogen (mg/dl)[a]	81	NA	NA	NA
PCR COVID-19	Positive	NA	NA	NA

Abbreviations: Alk-P, alkaline phosphatase; BE, base excess; BUN, blood urea nitrogen; Ca, calcium; COVID-19, coronavirus disease 2019; CPK, creatine phosphokinase; Hb, hemoglobin; HBSAg, hepatitis B surface antigen; Hct, hematocrit; HIV, human immunodeficiency virus; INR, international normalized ratio; K, potassium; LDH, lactate dehydrogenase; MCH, mean corpuscular hemoglobin; MCHC, mean cell hemoglobin concentration; MCV, mean corpuscular volume; Mg, magnesium; NA, not available; Na, sodium; P, phosphorus; PCR, polymerase chain reaction; PT, prothrombin time; PTT, partial thromboplastin time; RBC, red blood cells; SGOT, serum glutamic oxaloacetic transaminase; SGPT, serum glutamic pyruvic transaminase; Time, testing time; WBC, white blood cells.

[a]Decreased according to the laboratory normal range.

[b]Prolonged.

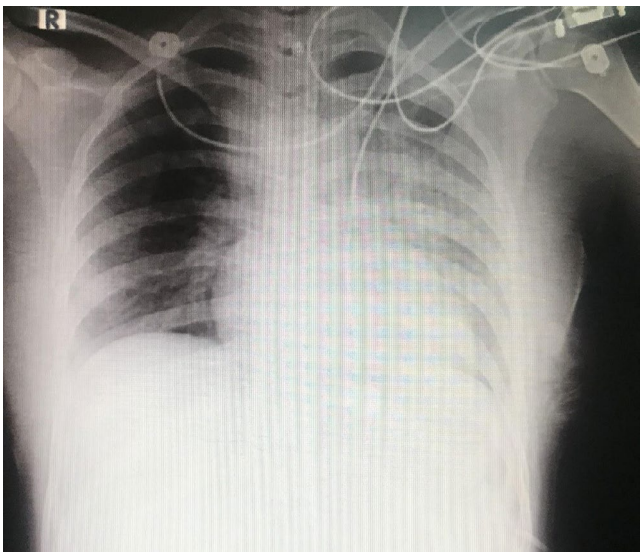

FIGURE 1 Patient chest X-ray

(LMWH) shows promising results in the prognosis of severe COVID-19 patients with higher levels of D-dimer by limiting the extent of coagulopathy.[15] In our patient, the PTT level at the time of death was 82, which was higher than the level at which we use heparin. The pregnancy-induced heart failure causes clots in the left ventricle, but in our patient the right-sided heart failure with hypercoagulopathy in COVID-19 infection was seen.

Treatment by heparin can also reduce the inflammatory biomarkers leading to a decline in the severity of COVID-19 infection.[16] According to a study by Betoule et al, preventive anticoagulant treatments should be considered in COVID-19 nonpregnant patients with D-dimer ≥ 3 μg/ml (11 mdf). Dashraath et al determined that pregnant women suspected of the severe form of COVID-19 infection during the third trimester are at a higher risk of thromboembolic disorders. Therefore, they suggested that these pregnant women be given the prophylactic weight-adjusted dose of heparin during hospitalization, and continued until delivery and six weeks postpartum.[9]

Like ours, a report in Milan, Italy, presented a case of a 17-year-old obese pregnant female on 29th week of pregnancy with shortness of breath lasted for a few days. After initial assessment, she was diagnosed with pulmonary embolism at the hospital and was received immediately antithrombotic treatment before and after the delivery, which saved her from further complications.[17]

To our best knowledge, this is the first report of maternal death due to COVID-19–associated coagulopathy. As a high number of pregnant women (25 to 30%) with MERS and SARS dead,[18] it is worthwhile to consider the maternal death in COVID-19 infection especially in the third trimester due to coagulative disorders that can be prevented via prophylactic treatment.

The result of this study could increase awareness and help the frontline worker or doctors to be well prepared to treat such patients promptly and hopefully, save lives.

ACKNOWLEDGMENTS

We would like to thank Dr Gerald Chi of the Cardiovascular Department at Harvard Medical School for his critical reviews and valuable opinions. Published with written consent of the patient. Published with written consent of the patient.

CONFLICT OF INTEREST

The authors of this manuscript declare no conflict of interest of any nature.

AUTHOR CONTRIBUTIONS

Sogand Goudarzi, M.D: involved in case interpretation, prepared the original draft, and reviewed the paper. Fatemeh Dehghani Firouzabadi, M.D: involved in case interpretation. Fatemeh Mahmoudzadeh, M.D: analyzed the patient data and prepared original draft. Soheila Aminimoghaddam, M.D: treated patient, supervised the project, and reviewed the draft.

DATA AVAILABILITY STATEMENT

All useful data are provided in this manuscript. Further data can be provided upon request.

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How to cite this article: Goudarzi S, Firouzabadi FD, Mahmoudzadeh F, Aminimoghaddam S. Pulmonary embolism in pregnancy with COVID-19 infection: A case report. *Clin Case Rep*. 2021;9:1882–1886. https://doi.org/10.1002/ccr3.3709