

CASE REPORT

Renal failure and lung hemorrhage as a presentation of COVID-19 infection, a case report

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Abstract

The concurrent involvement of the lung and kidneys happens in COVID-19 infection. The patient's respiratory symptoms resolved after hemodialysis. This finding raises the question that if hemodialysis can have a role in the treatment of COVID-19.

KEYWORDS

acute kidney injury, COVID-19, diffuse alveolar hemorrhage, hemodialysis, treatment

1 | INTRODUCTION

A 28-year-old single male came to the emergency room with myalgia, fever and oliguria. The patient received renal replacement therapy for acute kidney injury. He developed hemoptysis, and the follow-up chest CT scan showed signs of alveolar hemorrhage. After the improvement of renal function, the patient's signs and symptoms recovered.

Worldwide, we are facing a new viral infection known as the 2019 novel coronavirus disease (COVID-19). The earliest human infections had occurred by early December 2019, in Wuhan, the major transport hub of central China.¹ Severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS) are two large-scale pandemics during the past two decades due to Coronaviruses. Therefore,

SARS-related coronaviruses (SARSr-CoVs) have generally been thought to cause a future disease outbreak.² On March 11, 2020, the world health organization declared the pandemic of COVID-19.

The characteristics and clinical manifestations of COVID-19 are mainly fever, myalgia or fatigue, cough, respiratory distress, and dyspnea.^{3,4} Less common symptoms included sputum production, headache, hemoptysis, and diarrhea. The respiratory symptoms of COVID-19 infection are mostly dyspnea, cough, hemoptysis, sputum production, and secondary bacterial pneumonia. The extra pulmonary manifestations of COVID-19 disease are reported as cardiac injury, acute kidney injury (AKI),⁴ central nervous system involvement such as encephalitis,⁵ hematologic pathologies, and coagulopathies,⁶ and sepsis. In a recent meta-analysis by Jun Jie Ng, the author

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investigates the acute kidney injury incidence rate and the need for renal replacement therapy (RRT) in patients with COVID-19 in a general hospital and intensive care unit (ICU) setting. The results showed that the pooled incidence of AKI in all hospitalized patients is 3%, which is low comparing to other complications of COVID-19. When this analysis was conducted for the patients admitted to the ICU, the risk increases to 19%. Similarly, the need for RRT was 2% in all hospitalized patients. 13% of patients admitted to the ICU needed RRT as a part of their treatment. It seems to be a relationship between the development of AKI and ICU admission, even though there is not enough evidence to support such a claim. The AKI and need for RRT are indicators of the severity of the disease.⁷ One of the reasons the patients can develop AKI is renal injury due to rhabdomyolysis. Rhabdomyolysis can be the first manifestation of COVID-19.^{8,9}

The diagnosis of COVID-19 is based upon the clinical manifestations, laboratory testing and imaging. Reverse-transcription polymerase chain reaction (RT-PCR) test from oropharyngeal and nasopharyngeal swab samples and typical chest computerized tomography (CT) characteristics confirm the diagnosis of COVID-19.^{10,11} Chest CT scan had a sensitivity of 97% for diagnosing COVID-19 based on physicians' experience, which is even superior to RT-PCR.¹²

The first COVID-19 patient in Iran was diagnosed on February 19, 2020, at Qom city. In Hazrat-e-Rasoul general hospital, the first administered patient was diagnosed on February 20, 2020, after a short trip to Qom. Afterward, most patients visited the hospital's emergency department complaining of mostly fatigue and respiratory symptoms. Due to the novelty of the COVID-19, we believe that sharing our experience in diagnosing and treating the COVID-19 could be beneficial for those involved. This study discusses acute renal failure due to rhabdomyolysis and alveolar hemorrhages as a presentation of COVID-19 in a patient.

2 | CASE PRESENTATION

A 28-year-old single male came to the emergency department with fatigue, generalized myalgia, fever, cough, and oliguria. The patient was an accountant and had close contact with COVID-19-positive colleagues at work. The symptoms started five to six days earlier and were treated with hydration and home rest. With exacerbation of the symptoms, the patient experienced a reduction of urinary flow and dark brown urine color. Gradually patient became anuric and edematous.

On the initial examination, he had a low-grade fever with a 37.6 centigrade temperature and tachypnea with a respiratory rate of 22 per minute. Oxygen saturation was 94 percent on room air. His lung examination revealed mild crackles in both basal lung fields. Chest CT scan showed ground-glass opacities at both lower lobes of the lung parenchyma, which was

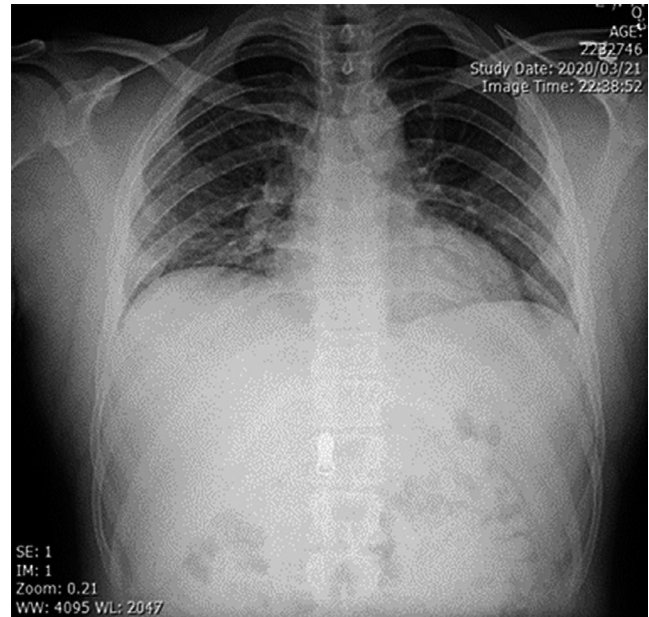


FIGURE 1 Chest X-ray at admission

typical for COVID-19 infection (Figures 1 and 2). Laboratory data showed elevated serum creatinine, creatinine phosphokinase (CPK), lactate dehydrogenase (LDH), electrolytes, and liver enzymes (Table 1). His urine analysis showed 4plus proteinuria with absent red blood cells (Table 2). Nephrology consultant suggested immediate hemodialysis for the treatment of rhabdomyolysis and acute kidney injury.

The patient transferred to an isolated respiratory ward considering the previous contact with COVID-19-positive patients and lung involvements. The nasopharyngeal PCR for COVID-19 was negative, so a serum antibody test was prescribed. Both IgM and IgG COVID-19 were positive, and COVID-19 infection was confirmed. The patient was treated with oral Hydroxychloroquine 200mg and intravenous Ceftriaxone one gr every 12 hours.

With effective hemodialysis, the symptoms began to recuperate. After one week from admission, the patient complained of hemoptysis. Hemoptysis was 10 to 20 cc fresh blood with each cough. Considering the reduction of serum hemoglobin from 14.7 to 9, the gastrointestinal consultant suggested upper gastrointestinal endoscopy, which showed normal esophagus, mild antral gastritis, and duodenitis. A follow-up lung CT scan was performed. The topography showed diffuse alveolar opacities with upper and middle lobes dominance, in addition to bilateral pleural effusion (Figures 3 and 4).

Secondary evaluation for renal etiologies was insignificant. The CT scan of the kidneys showed inflammation and edema of the renal parenchyma in this patient, which was detectable on sonography. Despite the four-plus proteinuria in the initial urine analysis, there were no signs of

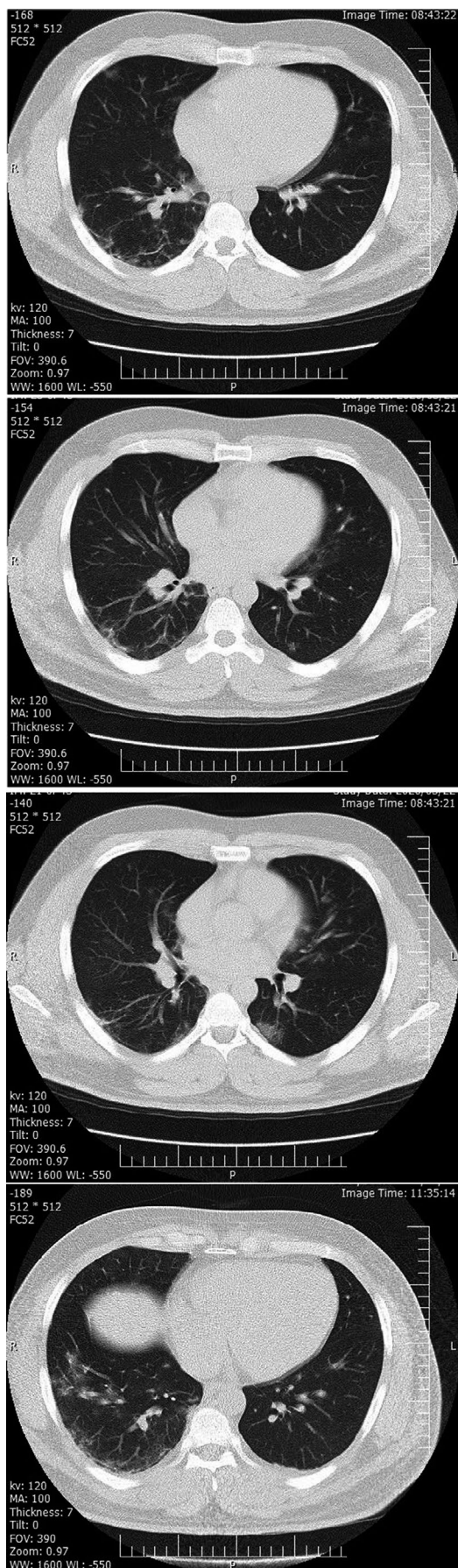


FIGURE 2 Chest CT scan at admission

TABLE 1 Laboratory results

Test	Unit	At admission	At discharge
WBC	*1000/mm ³	9	6.1
Segment	Percent	74	51
Lymphocyte	Percent	17	37
Hb	g/dL	14.7	9.1
MCV	fl	79.4	81.7
Plt	*1000/mm ³	202	250
Creatinine	mg/dL	5.8	20
BUN	mg/dL	56	1.6
Na	mEq/dL	135	141
K	mEq/dL	5.4	4.7
P	mg/dL	9.6	4.8
Ca	mg/dL	6	10.1
Alb	g/dL	3.3	3.5
Mg	mg/dL	3.9	2.9
AST	IU/L	1921	42
ALT	IU/L	356	80
Alk.p	IU/L	96	183
Bili Total	mg/dL	1.5	1.4
Bili Direct	mg/dL	0.3	0.3
CPK	IU/L	69 000	407
LDH	U/L	21 000	714
ESR			
CRP			
PT	Sec	13	15.3
INR	Indx	1	1.14
PTT	Sec	33	35

glomerulonephritis in the 24-hour urine sample (Table 3). After 14 hemodialysis sessions in two weeks, the serum creatinine stabled (Table 1) and hemoptysis resolved. The follow-up chest CT scan showed that both lungs' condition was improving, and the pleural effusion was resolved (Figure 5).

3 | DISCUSSION

Rhabdomyolysis is a clinical condition with high mortality and morbidity. This condition can be a result of autoimmune myopathies, septicemia, electrolyte abnormalities, substance abuse, alcohol use, or infection.¹³ Viral infections, such as influenza, can lead to rhabdomyolysis and acute renal failure. Other viruses that may cause rhabdomyolysis include human immunodeficiency virus (HIV), enteroviruses, Epstein-Barr virus (EBV), cytomegalovirus (CMV), adenovirus, herpes simplex virus (HSV), and varicella virus.¹⁴

TABLE 2 Urine analysis

Test	Result	Result
Color	Brown	Brown
Appearance	Turbid	Turbid
PH	5	5
Specific gravity	1.020	1.027
Protein	4 +	2 +
Blood/Hb	Weekly positive	Negative
Glucose	Negative	Negative
Ascorbic acid	Negative	Negative
Urobilinogen	Normal	Normal
Bilirubin	Negative	Negative
Nitrite	Negative	Negative
Ketone	Negative	Negative
WBC	5-7	6-8
RBC	4-5	2-3
Epithelial cell	6-8	12-14
Amorphous urate cast	Many	Many
Granular cast	4-5	2-4
Bacteria	Few	Few

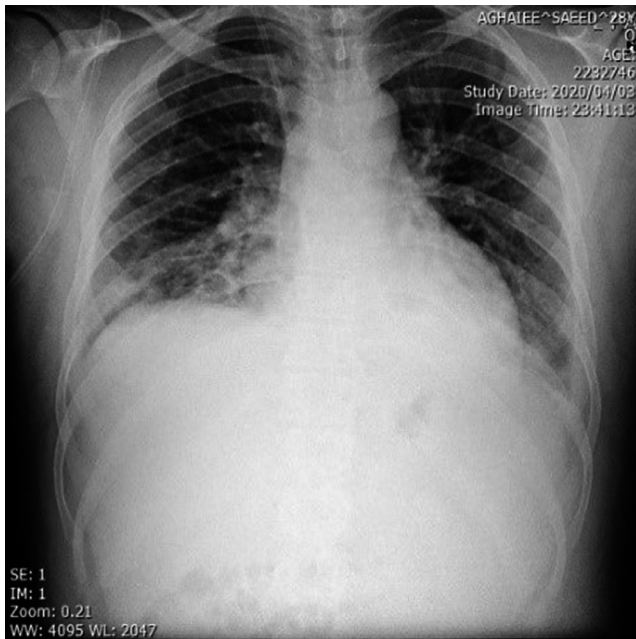


FIGURE 3 Follow-up chest X-ray

China reported the first cases of rhabdomyolysis and AKI. Also, AKI was one of the clinical manifestations of COVID-19 in the United States of America.¹⁵ To our knowledge, the prevalence of AKI in COVID-19 infection is low, but such involvement is an indicator of multiple organ dysfunction and the severity of the disease.⁷ The underlying reason for

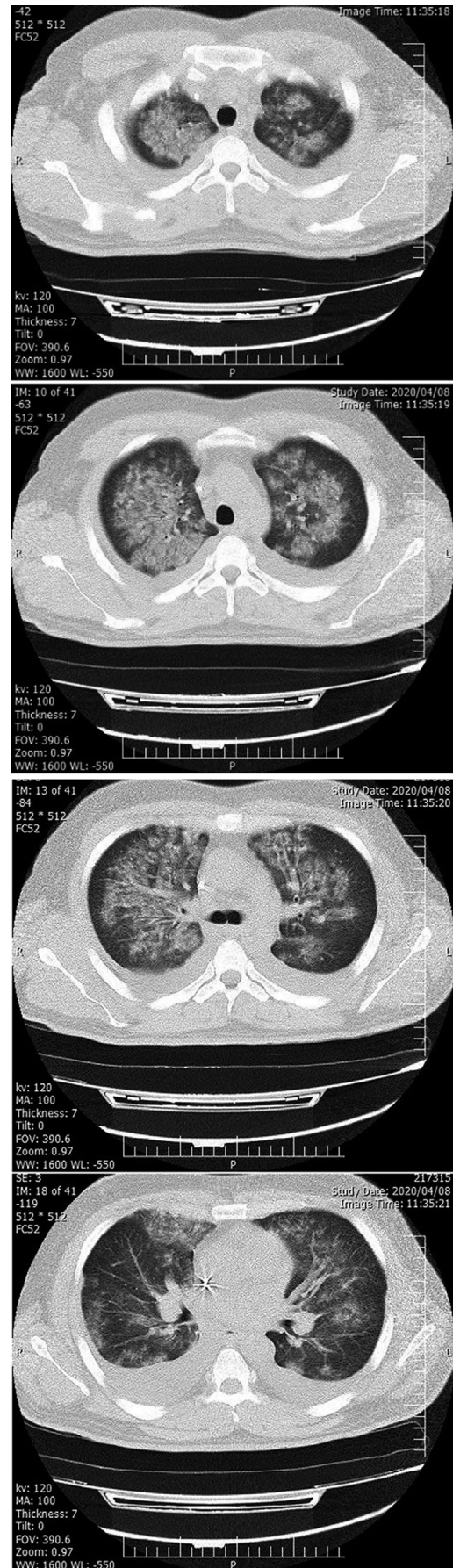


FIGURE 4 Follow-up chest CT scan

TABLE 3 Twenty four hour urine sample

Test	Result	Reference value
Urine Volume	3660	1-2 mL/kg
Urine Creatinine	1720	20-30 mL/kg
Urine Protein	256	Up to 100 mg

this finding is unknown. The possible mechanisms of kidney involvement in these patients can be explained by cytokine damage, organ crosstalk, and systemic effects.¹⁶ These mechanisms are firmly connected and have significant implications for extrapulmonary therapy.¹⁷ A close relationship between alveolar and tubular damage called the lung-kidney axis in patients suffering from acute respiratory syndrome has recently been confirmed.¹⁸

In the presented case, bearing in mind the initial findings of the laboratory data, imaging, and physical examination, the diagnosis of AKI due to rhabdomyolysis was confirmed. Considering the concurrency of lung and kidney involvement, it can be contemplated that the patient was suffering from extrapulmonary involvements of COVID-19. The diagnostic tests for vasculitis, including anti-GBM antibody, were all within the normal range (Table 4). Viral markers for hepatitis and human immunodeficiency virus were negative (Table 5). Iron levels and hormonal tests were within the normal range (Table 6). The only other treatment the patient received, other than Hydroxychloroquine and supporting care, was RRT for 14 sessions. With RRT's help, not only the kidney function improved, but also the pulmonary symptoms resolved. The hemoptysis stopped, and the radiologic findings such as alveolar opacities and pleural effusion resolved. The only immunomodulation the patient had received was Hydroxychloroquine, and it seems that RRT improved his kidney function and had an effect on lung involvement remission.

This finding raises the question of if renal replacement therapy can have a role in treating COVID-19's pneumonia.

The concurrent involvement of lung and kidneys happened in this patient due to COVID-19 infection. It is suggested that if the patient is presenting both respiratory and renal symptoms, have the COVID-19 disease in mind.

4 | CONCLUSION

Rhabdomyolysis and AKI can be an initial presentation of COVID-19 or may present at any time of the disease course. Clinicians should have a high suspicion for kidney involvement in COVID-19 patients. With early diagnosis and appropriate treatment, the morbidity and mortality of such complications can be reduced.

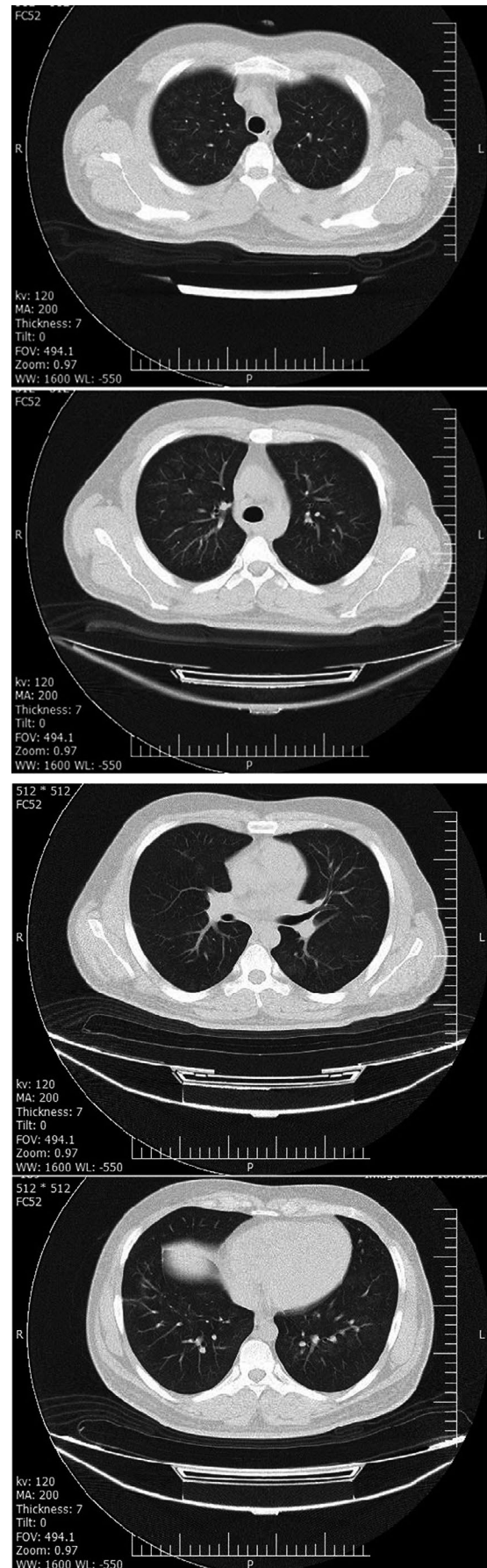
**FIGURE 5** Chest CT scan at discharge

TABLE 4 Rheumatologic factors

Test	Unit	Result	Reference value
ANA (Elisa)	Index value	0.535	Neg < 0.8 Equivocal 0.8-1.2 Pos > 1.2
Anti ds-DNA	U/mL	5	Neg < 12 Equivocal 12-18 Pos > 18
MPO Ab. (PANCA)	U/mL	1	Neg < 12 Equivocal 12-18 Pos > 18
PR3 Ab. (CANCA)	U/mL	1	Neg < 12 Equivocal 12-18 Pos > 18
C3	mg/dl	203	90-180
C4	mg/dL	81	10-40
Anti-GBM	U/mL	7.9	Neg < 20 Pos > 20

TABLE 5 Viral markers

Test	Unit	Result
HIV Ab	Qual	Negative
HCV Ab	Qual	Negative
HBS Ag	Qual	Negative

TABLE 6 Hormonal test

Test	Unit	Result	Reference value
Serum Iron	micg/dL	72	60-180
TIBC	micg/dL	360	230-440
Ferritin	ng/mL	826	17-390
iPTH	pg/mL	59	15-65

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interests.

AUTHOR CONTRIBUTIONS

Dr Nazanin Zamani gathers the information and prepares the manuscript. Dr Aldoos Aloosh was the attending responsible for the treatment options in the admission. Dr Samane Ahsant as the fellow responsible for the treatment of the patient. Dr niloofar Khodabandeloo was the general internist of the treatment team. Dr Tahere Zarook Ahimahalle was the attending responsible for the decisions regarding renal replacement therapy. Dr Aminreza Abkhoo was the radiologist, consulting the treatment team. Dr Taghi Riahi was the chief of the

pulmonology department and in charge of the patient's treatment plan.

ETHICAL STATEMENT

For publishing this case report, we asked Rasoul-Akram hospital ethical committee for approval. We informed the patient about the process of publishing a case report and he signed the consent form.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to the fact that their containing information that could compromise the privacy of research participants.

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