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## New Corona virus provokes peripheral gangrene in lower limb of type-1 diabetic patient: A case report

Hussein A. Ghanimi

College of Nursing, University of Al-Ameed, Karbala, Iraq, husseinalawi86@gmail.com

Diaa K. Abd Ali

College of Nursing, University of Al-Ameed, Karbala, Iraq

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# New Corona Virus Provokes Peripheral Gangrene in Lower Limb of Type-1 Diabetic Patient: A Case Report

Hussein A. Ghanimi\*, Diaa K. Abd Ali

College of Nursing, University of Al-Ameed, Karbala, Iraq

## Abstract

**Introduction:** Corona virus disease 2019 (COVID-19) presents with un-expected complications. Diabetic patients are more susceptible for lower limb complications.

**Importance:** Peripheral gangrene may be associated with COVID-19 in diabetic patients.

**Case presentation:** We described one diabetic patient with COVID-19 associated peripheral gangrene (PG) in lower limb. A 56 years old female patient with type-1 diabetes tested positive for COVID-19. She suffered from PG in her left foot. Hematological, biochemical, Doppler sonography, echocardiography (Echo) and electrocardiogram (ECG) tests were done for diagnosis and evaluation of the case. General checkup indicated presence of an abscess in her foot. Later, abscess drainage surgery was done. Unfortunately, her foot showed digital necrotic advanced to PG. The affected patient's foot eventuated to digital amputations.

**Clinical discussion:** PG correlated with leukocytosis, lymphopenia, eosinopenia and high levels of D-Dimer, ferritin, erythrocyte sedimentation rate (ESR) & C-reactive protein (C.R.P). In accordance, it associated with low levels of saturation of peripheral oxygen (SpO<sub>2</sub>) and anemia. On the other hand, the patient had normal Echo, ECG and platelets (PLT) count. Patient's HbA1C levels indicated good control of hyperglycemia. Poor prognosis associated with thrombotic events and coagulopathies could enhance the severity of COVID-19 and negatively impacted on its complications.

**Conclusion:** Even good control of hyperglycemia, COVID-19 as a thrombo-inflammatory disease may induce PG and digital amputation in diabetic patient.

**Keywords:** Case report, COVID-19, Patient, Type-1 diabetes, Peripheral gangrene, Digital amputation

## Introduction

New coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has emerged as a global health issue from China in December 2019. It was later known as coronavirus infection disease 2019 (COVID-19) (Umakanthan et al., 2020). COVID-19 involves the respiratory system causing acute respiratory distress syndrome (ARDS) and more prominent is its complications pertaining to the vascular system. In addition, COVID-19 patients with diabetes are susceptible for lower limb complications and require therapeutic

anti-coagulation (Rastogi et al., 2021). Accordingly, thrombotic complications and disseminated intravascular coagulation (DIC) are frequent in COVID-19 patients (Asakura & Ogawa, 2021). Moreover, COVID-19 also provokes arterial thrombotic events, including strokes and ischemic limbs (Wool & Miller, 2021). Poor prognosis of COVID-19 is associated with acrocyanosis, digital necrosis, PG and digital amputation (Adekiigbe et al., 2020; Sil et al., 2022). Therefore, the current case report has been reported in line with SCARE 2020 guideline (Agha et al., 2020) and aimed to demonstrate the incidence and management of PG associated with COVID-19 in lower limb of type-1 diabetic patient.

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\* Corresponding author at: College of Nursing, University of Al-Ameed, Najaf-Karbala highway street, Karbala, PO Box 198, Iraq.  
E-mail address: [hughanimi@alameed.edu.iq](mailto:hughanimi@alameed.edu.iq) (H.A. Ghanimi).

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## Case presentation

A 56 years old female complaining of ulceration in her left foot. The patient was a house wife. Since 2005, She had suffered from type 1 diabetes mellitus. Insulin injection was a medical choice to control blood glucose levels. She was examined by physicians (Internal medicine and orthopedic specialists) in private clinics in Karbala province, Iraq. Physicians advised her to do Doppler sonography in order to determine the size and location of ulceration in her foot. The results of Doppler sonography demonstrated that the patient's left foot had an abscess with dimensions (12 mm × 46 mm) located beneath the fifth finger. Orthopedic specialist prescribed medications (Ceftriaxone 1 g vial 1<sup>2</sup>, Dermacyn wound care spray twice/day). Next afternoon, orthopedic specialist removed the abscess in private clinic (Shown in Fig. 1-a), sutured the wound and prescribed medications (Meropenem 1 g vial 1<sup>3</sup>, acetaminophen vial 1<sup>3</sup>, and NS 1<sup>3</sup>). Expert nurse was gaved her the necessary medical care by using wound care spray, Dermacyn 1<sup>2</sup> and skin & wound hydrogel, Microcyn 1<sup>2</sup> for one week. Then, she left the clinic and went to her house. After one week, she admitted in the emergency department at Al-Kafeel hospital complaining of a recent diabetic foot (Shown in Fig. 1-b). On examination, she had also cough, breath difficult, fever, headache, back and joints pain, and general weakness. After doing a checkup (See Tables 1–4), she tested positive to COVID-19 antigen. Next day, she hospitalized in Al-Zahraa hospital for Covid-19 patients in Karbala province for further investigation and isolation. After that, she referred to Imam Hussein Medical City in Karbala for doing abscess drainage surgery. During the surgery, physicians had no choice to save her fifth finger; therefore, they decided to amputate it (Shown in Fig. 1-c, 1-d and 1-e). In accordance, her family members were accepted the physicians' decision and they signed formal consent to reflect their agreement for doing the surgery. After the surgery, she returned to Al-Zahraa hospital for Covid-19 patients for hospitalization. Physicians prescribed medications (Enoxaparin sodium 4000 IU 1<sup>1</sup>, Meropenem 1g vial 1<sup>3</sup>, and acetaminophen 1<sup>3</sup>). Expert nurse gaved her the necessary medical care by using wound care spray, Dermacyn 1<sup>2</sup> and skin & wound hydrogel, Microcyn 1<sup>2</sup>. Accordingly, she hospitalized for one night in the hospital. Next morning, she checked out and quarantined in her house. Physicians prescribed medications (Enoxaparin sodium 4000 IU 1<sup>1</sup> for ten days, Meropenem 1 g vial 1<sup>2</sup> for five days and from sixth day Levofloxacin 500 mg was taken instead of

Meropenem 1 g, and acetaminophen 1<sup>3</sup>. Expert nurse was gaved her the necessary medical care by using wound care spray, Dermacyn 1<sup>2</sup> and skin & wound hydrogel, Microcyn 1<sup>2</sup> for ten days. After ten days, her second finger exhibited necrotic features (Shown in Fig. 1-f). After examination, orthopedic physician decided to amputate it (The second finger in the left foot) (Shown in Fig. 1-g) in private clinic. Physician prescribed medications; Rivaroxaban 10 mg 1<sup>1</sup> and Triple Antibiotic Ointment (Bacitracin Zinc, Neomycin Sulfate and Polymyxin-B-Sulfate) 1<sup>2</sup> for ten days. Expert nurse was gaved her the necessary medical care by using Triple Antibiotic Ointment for ten days. After that, orthopedic physician examined her foot. He told her that her foot got well response to medical treatment (Shown in Fig. 1-h). On top of that, he recommended her to visit a plastic surgeon for doing plastic surgery.

## Discussion

COVID-19 was first diagnosed in China in 2019. Later, it declared as a pandemic by the World Health Organization (WHO), 2020 (Umakanthan et al., 2020). It causes a spectrum of diseases; strokes, ischemic limbs, acrocyanosis, digital necrosis and PG (Pourdowlat et al., 2020; Sil et al., 2022). In addition to cytokine storms, COVID-19 provokes coagulopathies and thrombosis (Gómez-Mesa et al., 2021). Also, COVID-19 patients are at high risk for venous thromboembolism (Terpos et al., 2020). Diabetic patients who tested positive for COVID-19 are susceptible for lower limb complications (Rastogi et al., 2021). Prolonged uncontrolled hyperglycemia increases the risk of adverse prognosis in COVID-19 patients (Zhu et al., 2021). Present case report indicated that the patient suffered from PG associated with COVID-19 in her left foot. PG correlated with leukocytosis, neutrophilia, lymphopenia, and eosinopenia. Previous studies have been shown that the COVID-19 correlated with elevated total leukocytes & neutrophils counts and low lymphocytes count (Fathi & Rezaei, 2020; Zuo et al., 2021). Also, Outh et al., 2021 demonstrated that COVID-19 patients had low eosinophils count (Outh et al., 2021). Incidence of PG in the left foot of the patient correlated with high levels of D-Dimer, ferritin, ESR and C.R.P titers. In accordance, hematological findings have been shown that the levels of D-Dimer, ferritin, ESR and C.R.P titers were elevated in COVID-19 patients (Velavan & Meyer, 2020), associated with disease worsening (Gómez-Mesa et al., 2021; Terpos et al., 2020) and correlated with PG (Adekiigbe et al., 2020). Low



Fig. 1. Case presentation. (a) Patient's left foot suffered from an abscess which removed by orthopedic specialist. (b) Her left foot complaining of a recent diabetic foot. (c), (d) and (e) abscess drainage surgery was done for her left foot and physicians decided to amputate her fifth finger. (f) Her second finger exhibited necrotic features, after examination, orthopedic physician decided to amputate it (g). Later, her foot got well response to medical treatment (h).

SpO<sub>2</sub> had negative impact on the outcomes of COVID-19 infected diabetic patients (Li et al., 2020). Similar to that, our findings indicated that the patient had low SpO<sub>2</sub> value which could be rated as a provoker of the severity of COVID-19. Our study indicated that the patient had anemia. Anemia is a

common and persistent finding associated with COVID-19 (Bergamaschi et al., 2021). A novel function of COVID-19 on platelet activation may provoke proinflammatory and prothrombotic responses (Zhang et al., 2020). Otherwise, PLT count could be detected in normal range or mildly



Table 1. Findings of Complete blood count (CBC).

No.	Test	Value	Unit	Normal range
1.	HGB	10.2	g/dl	11.5–16.5
2.	R.B.C count	3.50	$10^6/\text{mm}^3$	$4.5 \times 10^6 - 6 \times 10^6$
3.	W.B.C count	22.5	$10^3/\text{mm}^3$	$(4-11) \times 10^3$
4.	Mean corpuscular volume (MCV)	88	$\text{micron}^3$	80–97
5.	Mean corpuscular hemoglobin (MCH)	29.1	picogram	26.5–33.5
6.	Mean corpuscular hemoglobin conc. (MCHC)	33.1	g/dl	31.5–35
7.	Platelets (PLT)	283	$10^3/\text{mm}^3$	150–450
8.	Mean platelet volume (MPV)	7.48	fL	7.5–11.5
9.	RDW	15.4	%	11–16
10.	Neutrophils	86.4	%	55–70
11.	Lymphocytes	7.83	%	20–35
12.	Eosinophils	0.090	%	1–3
13.	Monocytes	5.18	%	1–10
14.	Basophils	0.533	%	0.5–1
15.	Hematocrit (HCT)	30.8	L/L	36–45

Table 2. Findings of COVID antigen, Saturation of peripheral oxygen ( $\text{SpO}_2$ ), Biochemistry, Renal function tests and Virology.

No.	Test	Value	Unit	Normal range
1.	COVID antigen	Positive		
2.	$\text{SpO}_2$	77	%	95–100
3.	Blood sugar (R)	342	mg/dl	109–180
4.	HbA1C	7.57	%	<5.7
5.	Albumin	2.6 g/dl	g/dl	3.5–5.2
6.	Blood Urea	29 mg/dl	mg/dl	20–50
7.	Creatinine	0.84 mg/dl	mg/dl	0.7–1.2
8.	D-Dimer	855	ng/ml	$\leq 500$
9.	Ferritin	360	ng/ml	20–200
10.	C.R.P titer	185	mg/l	$\leq 5$
11.	ESR	43	mm/hr.	<20
12.	HIV	0.14	S/CO	0.00–1.0
13.	HCV	0.12	S/CO	0.00–1.0
14.	HBSAG	0.22	S/CO	0.00–1.0

decreased in COVID-19 patients associated with coagulopathies (Alnima et al., 2022). Accordingly, our results showed normal PLT count. The severity and detrimental complications of COVID-19 associated with uncontrolled hyperglycemia in diabetic patients (Bode et al., 2020). But, patient's HbA1C levels were reflected good control of hyperglycemia. This finding confirmed the pivotal role of COVID-19

Table 3. Echocardiographic report.

Cardiac	Patient's value	Comments	Conclusion
LVIDD	4.8		Normal
LVIDS	2.4	• Normal cardiac chamber size.	resting
IVS	1.1	• Normal cardiac chamber valves.	Echo
PLVW	1.1	• Good myocardial contractility.	
LA	2.8	• Good Lt ventricular systolic	
AO	2.6	function, No mural thrombus,	
RA	2.4	No aneurysm.	
RV	2.1	• Normal pericardium,	
EF %	64%	No effusion.	

Table 4. Electrocardiogram report.

Cardiac	Patient's value
Vent rate	80 bpm
PR int.	164 ms
QRS dur.	90 ms
QT/QTc int.	402/437 ms
P/QRS/T axis	55/-27/39
RV5/SV1 amp.	1.410/0.945 mV
RV5+SV1 amp.	2.355 mV
1100 Sinus rhythm	
7202 Moderate left axis deviation	
9110 ** Normal ECG **	

and its complications in triggering PG in the lower limb of the type-1 diabetic patient. Our findings showed that the patient had normal resting Echo and ECG. This finding reflects the ambiguity and un-expected clinical outcomes of COVID-19.

## Conclusion

Current case study concluded that the type-1 diabetic patient had PG associated with COVID-19 in her left foot. PG correlated with anemia, low  $\text{SpO}_2$ , leukocytosis, neutrophilia, lymphopenia, eosinopenia, high levels of D-Dimer, ferritin, ESR and elevated C.R.P titers. Accordingly, anemia,  $\text{SpO}_2$ , D-Dimer, ferritin, ESR and inflammatory biomarkers (total leukocytes, neutrophils, lymphocytes, eosinophils counts and C.R.P) were powerful risk factors that had a prominent role in prognosis of COVID-19 induced PG. Even good control of hyperglycemia, affected patient's foot was had to suffer from digital amputation. During the course of disease, anticoagulants, antibiotics, analgesics, and wound care medications were used as therapeutic management (For details, see section of Case Presentation).

## Patient perspective

None.

## Provenance and peer review

Not commissioned, externally peer-reviewed.

## Source of funding

None.

## Ethical approval

This study protocol was reviewed and approved by Institute Review Board, University of Al-Ameed, Approval number: IQ.UOA.2022.10.1.3.

## Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

## Author contribution

Hussein A. Ghanimi participated in documentation of surgical and treatment processes/photography of the case. Hussein A. Ghanimi and Daa K. Abd Ali participated in writing and reviewing the manuscript.

## Research registration

None.

## Guarantor

Hussein A. Ghanimi.

## Conflict of Interest

None declared.

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