Article published online: 2021-06-30

Acute Extremity Gangrene in COVID-19 Patients

Vybhav Deraje[1] Rajendra S. Gujjalanavar[1] Subrata Das[2] Raghu Janardhan[2] Pallavi Rao[3]

[1]Department of Plastic and Reconstructive Surgery, Sakra World Hospital, Bangalore, Karnataka, India
[2]Department of Internal Medicine, Sakra World Hospital, Bangalore, Karnataka, India
[3]Department of Laboratory Medicine, Sakra World Hospital, Bangalore, Karnataka, India

Address for correspondence Vybhav Deraje, MBBS, MS, DNB, Department of Plastic and Reconstructive Surgery, Sakra World Hospital, Room 2, Multi OPD, Sy No 52/2 & 52/3, Devarabeesanahalli, Varthur Hobli, Opp Intel, Outer Ring Rd, Marathahalli, Bengaluru, Karnataka 560103, India (e-mail: vybhavd84@gmail.com).

Indian J Plast Surg 2021;54:237–239.

As elective plastic surgery takes the backseat during the COVID-19 pandemic, we have noticed a pattern in the slew of referrals from the "COVID" ward of the hospital. Among the 2284 COVID-19 positive cases treated, we were asked to manage four cases of acute dry gangrene of extremities. A summary of all the patients is presented in ►**Table 1**.

Some authors have provided early evidence of complement-mediated microvascular injury and coagulopathy in severe COVID-19 disease.[1] Wang reported two critically ill patients with COVID-19-related retiform purpura, progressing to digital gangrene, who demonstrated microthrombi in the blood vessels on biopsy, elevated D-dimer levels, antithrombin III deficiency, and positive anticardiolipin IgG/IgM antibodies.[2] A larger study from Italy concluded that the incidence of acute limb ischemia increased during the pandemic, and revascularization was lower than usual due to the procoagulant state.[3]

The common etiological factor proposed is a state of hypercoagulability, which is induced by micro- and macroangiopathy, caused by either a direct complement-mediated effect of the virus or an antibody-mediated immunological response. The delayed immunological response seems to be a logical reason for 3 of 4 patients in our series, since patients 1, 2, and 4 developed gangrene only late in the course of the disease. However, in patient 3, acute gangrene was the presenting symptom in the absence of any other typical symptoms of COVID-19 infection which, might be due to direct effect of the virus on the vasculature.

Differential diagnosis for acute ischaemia in critically ill patients include vasopressor-induced extremity gangrene, myocardial infarction (MI) with thrombi in left ventricle, hypothermia, atherosclerotic thrombi, shock, disseminated intravascular coagulation (DIC), and thrombolytic therapy. In most cases, the causation is multifactorial.

Middeldorp reported COVID-19 patients who received routine prophylactic doses of low-molecular weight heparin (LMWH) had significantly higher venous thromboembolism

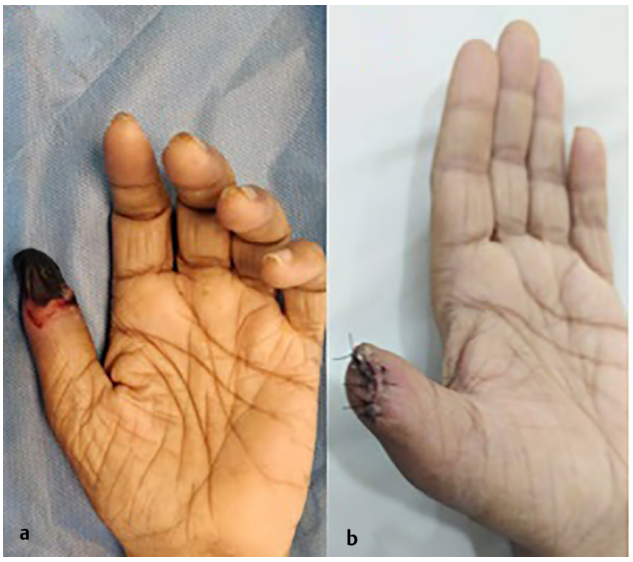

Fig. 1 Preoperative (**a**) and postoperative (**b**) pictures of patient 1.

Fig. 2 Preoperative (**a**) and postoperative (**b**) pictures of patient 3.

published online
June 30, 2021

DOI https://doi.org/10.1055/s-0041-1731853
ISSN 0970-0358

© 2021. Association of Plastic Surgeons of India.
This is an open access article published by Thieme under the terms of the Creative Commons Attribution-NonDerivative-NonCommercial-License, permitting copying and reproduction so long as the original work is given appropriate credit. Contents may not be used for commercial purposes, or adapted, remixed, transformed or built upon. (https://creativecommons.org/licenses/by-nc-nd/4.0/).

Thieme Medical and Scientific Publishers Pvt. Ltd. A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

Table 1 Summary of all patients in the case series

	Patient 1	Patient 2	Patient 3	Patient 4
Age	56	58	80	60
Sex	Male	Female	Male	Male
Pattern of gangrene	Left thumb up to IP joint	Left 4th toe up to IP joint	Left 1st and 4th toe up to MTP joint. Left 5th toe up to IP joint	Left foot great toe and all toes of right foot—up to IP joint
Onset of gangrene (week of admission)	6th week	3rd week	At presentation	3rd week
Management of gangrene	Revision amputation of left thumb at the head of proximal phalanx under local anesthesia (►**Fig. 2**)	Conservative	Forefoot amputation under spinal anesthesia (►**Fig. 1**)	Conservative
Comorbidities	Diabetes	Bronchial asthma	Diabetes, concentric left ventricular hypertrophy	Hypertension, bronchial asthma
Doppler	Not done	Arterial: bilateral CFA, SFA, PA, ATA, PTA, and DPA are patent and show normal flow and spectral waveforms Venous: bilateral DVT (dilated, noncompressible CFV, SFV with echogenic contents within suggestive of DVT, dilated PV with no flow within.	Not done	Arterial: right—triphasic flow in CFA and SFA. biphasic flow in PA, ATA, PTA. monophasic flow in DPA. Atherosclerotic changes in PA and below Left—triphasic flow CFA and SFA. Biphasic flow in PA. Monophasic flow in ATA, PTA and DPA Venous: normal
Angioplasty	Not done	Not done	Left SFA complete occlusion at origin and multilevel stenosis 40–50%	Not done
d-dimer	Not tested in current admission	Elevated	Not tested	Elevated
Vasopressor support	No	Yes	No	Yes
Duration of hospital stay (cumulative)	47 days	39 days	2 days	20 days
Duration of ICU stay	21 days	15 days	–	16 days
Severity of COVID-19 [a]	Severe (ARDS)	Severe (septic shock)	Mild	Severe (septic shock)
COVID-19-related complications	Pneumonia, critical care-induced neuromyopathy, grade III sacral pressure sore	Pneumonia, bilateral lower limb DVT, HIT, type 1 respiratory failure, hyperhomocysteinemia	–	Pneumonia
Outcome	Recovery	Recovery	Recovery	Death

Abbreviations: ARDS, acute respiratory distress syndrome; ATA, anterior tibial artery; CFA/CFV, common femoral artery/vein; DPA, dorsalis pedis artery; DVT, deep vein thrombosis; HIT, heparin-induced thrombocytopenia; IP, interphalangeal; MTP, metatarsophalangeal; PA/PV, popliteal artery/vein; PTA, posterior tibial artery; SFA/SFV, superficial femoral artery/vein.
[a] Based on Government of India guidelines—https://www.mohfw.gov.in/pdf/ClinicalManagementProtocolforCOVID19.pdf.

rate when compared with non-COVID acutely ill patients.[4] This suggests that prophylactic dose of LMWH may not be enough, and initiation of an appropriate dose of anticoagulant might be necessary.[5] Initiation of therapeutic dose of LMWH in admitted COVID-19 patients (with moderate-to-severe pneumonia or d-dimer greater than 500 ng/mL) is our current practice. We have neither seen any adverse effect of this protocol, like bleeding in our patients, nor has this been reported in literature. Those with limb ischemia and no contraindication for heparin use were treated with unfractionated heparin (UFH). We now await what difference this protocol makes in subsequent waves of the pandemic.

Conflict of Interest

None.

Acknowledgments

The authors wish to thank Mr. Abdul Majeed (Physician Assistant—Department of Plastic & Reconstructive surgery) and Ms. Senthamarai Selvi (Plastic Surgery Nurse) for their help in data collection and documentation.

References

1 Magro C, Mulvey JJ, Berlin D, et al. Complement associated microvascular injury and thrombosis in the pathogenesis of severe COVID-19 infection: A report of five cases. Transl Res 2020;220:1–13
2 Wang JS, Pasieka HB, Petronic-Rosic V, Sharif-Askary B, Evans KK. Digital gangrene as a sign of catastrophic Coronavirus disease 2019-related microangiopathy. Plast Reconstr Surg Glob Open 2020;8(7):e3025
3 Bellosta R, Luzzani L, Natalini G, et al. Acute limb ischemia in patients with COVID-19 pneumonia. J Vasc Surg 2020;72(6):1864–1872
4 Middeldorp S, Coppens M, van Haaps TF, et al. Incidence of venous thromboembolism in hospitalized patients with COVID-19. J Thromb Haemost 2020;18(8):1995–2002
5 Schultz K, Wolf JM. Digital ischemia in COVID-19 patients: case report. J Hand Surg Am 2020;45(6):518–522