



Access this article online

Quick Response Code:



Website:

www.turkjemergmed.com

DOI:

10.4103/2452-2473.336102

Case Report

Catheter-directed thrombolysis in a COVID-19 patient complicated with pulmonary embolism

Betul Balaban Kocas*, Kadriye Kilickesmez

Department of Cardiology, Prof. Dr. Cemil Tascioglu City Hospital, Istanbul, Turkey

*Corresponding author

Abstract:

Since December 2019, the novel coronavirus (COVID-19) outbreak has become an important public health problem and one of the most common causes of morbidity and mortality worldwide. COVID-19 is highly associated with thromboembolic events, like deep venous thrombosis and pulmonary embolism (PE). Catheter-directed thrombolysis (CDT) provides effective reperfusion for the treatment of PE. We report a patient who was presented with intermediate-risk PE and had a saccular aneurysm of the anterior cerebral artery. The patient was suffered from recent COVID-19 infection and ischemic stroke. As the patient had high bleeding risk for full-dose systemic thrombolytic therapy, CDT was the preferred method for reperfusion. Finally, the patient was discharged from the hospital uneventfully 4 days later. In the setting of high bleeding risk, CDT seems to be an effective and safe approach in patients with intermediate-risk PE.

Keywords:

Catheter-directed thrombolysis, COVID-19, pulmonary embolism

Introduction

COVID-19 is a recently identified disease that is highly associated with thromboembolic events, such as deep venous thrombosis and pulmonary embolism (PE).^[1,2] Catheter-directed thrombolysis (CDT) is an effective and safe method used for reperfusion, especially in intermediate- and high-risk PE patients with absolute or relative contraindications for full-dose thrombolytic therapy. Herein, we report a case of PE in a patient with COVID-19, successfully treated with CDT.

Case Report

We present a case of a 52-year-old, morbid obese female patient with a history of hypertension and recent ischemic stroke.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

A saccular aneurysm of the anterior cerebral artery was incidentally detected in cranial imaging at the time of hospitalization for stroke 2 months before [Figure 1]. Shortly afterwards, the patient was hospitalized with COVID-19, which was confirmed by both viral polymerase chain reaction and thorax computed tomography (CT). The patient stated that she had not used low-molecular-weight heparin (LMWH) therapy after hospital discharge for the last week. She was admitted to our emergency department with the complaint of shortness of breath. On physical examination, blood pressure was 90/70 mmHg, heart rate was 110 per minute, and oxygen saturation was 88%. Electrocardiogram revealed sinus tachycardia with right axis deviation [Figure 2a]. Serum levels of D-dimer and troponin-T were elevated. Bedside transthoracic echocardiography (TTE) examination showed enlargement of the

How to cite this article: Kocas BB, Kilickesmez K. Catheter-directed thrombolysis in a COVID-19 patient complicated with pulmonary embolism. Turk J Emerg Med 2022;22:54-7.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

Submitted: 06-07-2021

Revised: 14-09-2021

Accepted: 20-09-2021

Published: 20-01-2022

ORCID:

BBK: 0000-0002-6107-3073

KK: 0000-0002-2139-9909

Address for correspondence:

Dr. Betul Balaban Kocas,
Department of Cardiology,
Prof. Dr. Cemil Tascioglu
City Hospital, Kaptanpasa
Street, Okmeydani, Sisli,
34384 Istanbul, Turkey.
E-mail: betulbalaban@yahoo.com

right heart chambers, decrease in right ventricular systolic function and increase in systolic pulmonary artery pressure (PAP) (65 mmHg). In pulmonary CT angiography, filling defects of massive PE causing significant obstruction in both pulmonary artery bifurcation and main branches were observed [Figure 2b]. CDT method was preferred for reperfusion as our patient had an intracranial aneurysm and a recent history of ischemic stroke. Therapeutic dose of LMWH was administered before the procedure in the emergency department. As the right common femoral vein has a relatively straight course to the right heart, interventional cardiologists mostly prefer it for access. Therefore, we performed the procedure via the right common femoral vein route and general protection equipment against COVID-19 were used during the procedure. Following pulmonary artery cannulation, thrombus aspiration and 10 mg bolus tissue plasminogen activator (tPA), alteplase, was administered to both pulmonary arteries [Figure 3a]. As occlusion continued at the left lower pulmonary artery level, consecutive dilatations were performed with a 5.0 mm × 15 mm noncompliant balloon [Figure 3b]. Distal pulmonary artery flow was restored in control images [Figure 3c]. A catheter was left at the main pulmonary artery and a 24-h tPA infusion was given at a rate of 1 mg per hour. The patient's clinical condition improved rapidly within 24 h. Control TTE showed improvement in right ventricular systolic function and decrease in systolic PAP (30 mmHg). In lower extremity venous Doppler ultrasonography, intraluminal thrombus was observed at the level of the popliteal vein. Thrombus was thought to be persistent due to the lack of full-dose systemic fibrinolytic therapy. Inferior vena cava filter application was not considered as the level of thrombus was not above the popliteal vein. LMWH was administered during hospitalization. The patient was discharged from the hospital uneventfully on therapeutic dose of rivaroxaban. Written informed consent was obtained from the patient for publication of this case report, including the results of imaging methods.

Discussion

This case highlights the efficacy and safety of CDT in patients with COVID-19 related PE who had high bleeding risk for thrombolytic therapy. Mechanisms such as acute lung injury, cytokine storm, hematopoietic stem cells and/or bone marrow stroma invasion, and hypoxia developing during the course of COVID-19 trigger prothrombotic events and increase the incidence of acute PE.^[3] As in our case, rapid diagnosis and effective intervention are vital in high-risk PE patients.

In CDT, direct placement of a multi-side-hole catheter enables a high thrombolytic drug concentration in the

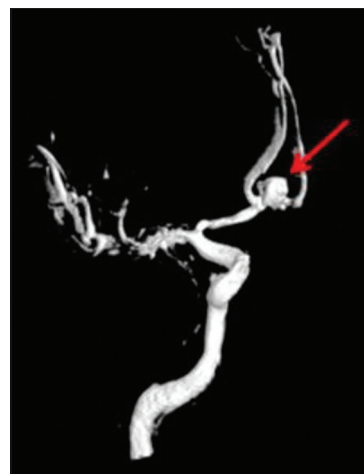


Figure 1: Three-dimensional computed tomographic angiographic view of intracranial aneurysm of the anterior cerebral artery

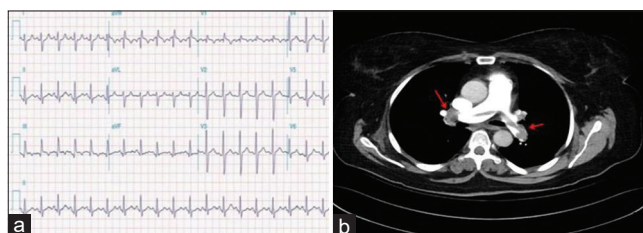


Figure 2: (a) Patient's admission electrocardiogram. (b) Computed tomographic pulmonary angiogram of the chest, large filling defects in the main, bilateral main branches of pulmonary arteries

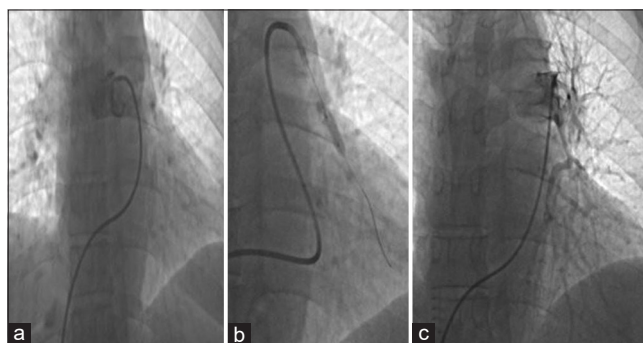


Figure 3: (a) Pulmonary angiographic view of the left pulmonary artery following thrombus aspiration and alteplase administration. (b) View of the balloon dilatation to the left pulmonary artery. (c) Maintaining the normal left pulmonary artery distal flow

thrombus. Furthermore, direct fibrinolytic drug infusion increases intra-thrombal pressure, which provides a rapid and effective lysis of the clot.^[4] After catheter engagement, a bolus of 2–10 mg of thrombolytic may be given before initiation of the infusion. With an infusion rate of 1–2 mg/h, a total dose of 15–30 mg of tPA is used in CDT, whereas a standard dose of 100 mg tPA given in systemic full-dose thrombolysis.^[5] CDT is efficient and has lower risk of major hemorrhage compared to systemic full-dose thrombolysis.^[5] Besides, it is a less invasive method than surgical embolectomy and has

lower incidence of periprocedural morbidity. Hence, it seems reasonable to use CDT in an increasingly manner to restore right ventricle (RV) function earlier in intermediate and high-risk PE patients.

The current literature on CDT is mostly limited to case series and few randomized controlled studies designed with a small number of patients. CDT was compared with anticoagulation therapy in many of these studies, and no significant difference was found in terms of mortality and bleeding complications.^[6-8] However, CDT provided an earlier reduction in RV/left ventricle ratio and PAP in intermediate-risk PE patients compared to anticoagulation therapy.^[6-8] Other limitations regarding these trials may be the enrollment of a relatively small number of intermediate- and high-risk PE patients, like our case, and lack of head-to-head comparison of CDT with full-dose systemic thrombolytic therapy.

Systemic fibrinolytic therapy was accepted as the traditional reperfusion therapy in massive PE. According to current guidelines,^[9] high-risk PE patients (patients with shock status or deep hypotension) are recommended to be treated by emergency surgical embolectomy in case of a contraindication for fibrinolytic therapy. Unfortunately, this option was not suitable for our patient because she had severe comorbidities for surgical treatment and a lack of adequate experience for surgical embolectomy in our center. Theoretically, it is known that there is a risk of pulmonary hemorrhage with systemic thrombolytic therapy in the damaged lung parenchyme due to COVID-19.^[10] Besides COVID-19 infection, our patient had an intracranial aneurysm and a recent history of ischemic stroke. Therefore, CDT was preferred for reperfusion therapy. CDT may be an additional reliable therapeutic option in patients with COVID-19 and PE who had comorbidities facilitating bleeding.

Arterial and venous thromboembolic events had been frequently reported during the course of COVID-19.^[11,12] To note, these prothrombotic complications were not rarely seen following hospital discharge. In this context, PE should be considered in patients presenting with acute shortness of breath or deoxygenation following COVID-19 infection.^[13] Besides, patient education and medical advice for the continuation of the anticoagulation therapy after hospital discharge is of extreme importance; especially in patients with high risk for thromboembolism.

Conclusion

PE should be considered in the differential diagnosis of acute-onset dyspnea and extended thromboprophylaxis should be considered in COVID-19 patients with high risk for thromboembolic events following hospital

discharge. CDT may be an effective and reliable therapeutic option in patients with COVID-19-related PE who had high bleeding risk for full-dose systemic thrombolytic therapy.

Authorship contributions

Concept - B.B.K.; Design -B.B.K., K.K.; Supervision - K.K.; Materials -B.B.K., K.K.; Data collection and/or processing - B.B.K., K.K.; Analysis and/or interpretation -B.B.K., Literature search -B.B.K., K.K.; Writing - B.B.K.; Critical revision -K.K.

Conflicts of interest

None Declared.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understand that name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

None.

References

1. Goyal P, Choi JJ, Pinheiro LC, Schenck EJ, Chen R, Jabri A, *et al.* Clinical characteristics of Covid-19 in New York City. *N Engl J Med* 2020;382:2372-4.
2. Han H, Yang L, Liu R, Liu F, Wu KL, Li J, *et al.* Prominent changes in blood coagulation of patients with SARS-CoV-2 infection. *Clin Chem Lab Med* 2020;58:1116-20.
3. Mei H, Hu Y. Characteristics, causes, diagnosis and treatment of coagulation dysfunction in patients with COVID-19. *Zhonghua Xue Ye Xue Za Zhi* 2020;41:185-91.
4. Tapson VF, Gurbel PA, Witty LA, Pieper KS, Stack RS. Pharmacomechanical thrombolysis of experimental pulmonary emboli. Rapid low-dose intraembolic therapy. *Chest* 1994;106:1558-62.
5. Chiarello MA, Sista AK. Catheter-directed thrombolysis for submassive pulmonary embolism. *Semin Intervent Radiol* 2018;35:122-8.
6. Kucher N, Boekstegers P, Müller OJ, Kupatt C, Beyer-Westendorf J, Heitzer T, *et al.* Randomized, controlled trial of ultrasound-assisted catheter-directed thrombolysis for acute intermediate-risk pulmonary embolism. *Circulation* 2014;129:479-86.
7. Piazza G, Hohlfelder B, Jaff MR, Ouriel K, Engelhardt TC, Sterling KM, *et al.* A prospective, single-arm, multicenter trial of ultrasound-facilitated, catheter-directed, low-dose fibrinolysis for acute massive and submassive pulmonary embolism: The SEATTLE II study. *JACC Cardiovasc Interv* 2015;8:1382-92.
8. Furfaro D, Stephens RS, Streiff MB, Brower R. Catheter-directed thrombolysis for intermediate-risk pulmonary embolism. *Ann Am Thorac Soc* 2018;15:134-44.
9. Konstantinides SV, Meyer G, Becattini C, Bueno H, Geersing GJ, Harjola VP, *et al.* 2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS): The task force for the diagnosis and management of acute pulmonary embolism of the European Society of Cardiology (ESC). *Eur Respir J* 2019;54:1901647.
10. Pendower L, Benedetti G, Breen K, Karunanithy N. Catheter-directed thrombolysis to treat acute pulmonary thrombosis in a patient with COVID-19 pneumonia. *BMJ Case Rep* 2020;13:e237046.

Kocas and Kilickesmez: Catheter-directed thrombolysis in pulmonary embolism

11. Ullah W, Saeed R, Sarwar U, Patel R, Fischman DL. COVID-19 complicated by acute pulmonary embolism and right-sided heart failure. *JACC Case Rep* 2020;2:1379-82.
12. Poissy J, Goutay J, Caplan M, Parmentier E, Duburcq T, Lassalle F, *et al.* Pulmonary embolism in patients with COVID-19: Awareness of an increased prevalence. *Circulation* 2020;142:184-6.
13. Rosovsky RP, Grodzin C, Channick R, Davis GA, Giri JS, Horowitz J, *et al.* Diagnosis and treatment of pulmonary embolism during the coronavirus disease 2019 pandemic: A position paper from the national PERT consortium. *Chest* 2020;158:2590-601.