Scientific Research Publishing

Open Journal of Nephrology, 2025, 15(3), 408-413
https://www.scirp.org/journal/ojneph
ISSN Online: 2164-2869
ISSN Print: 2164-2842

SARS-CoV-2-Induced Thrombosis of the Supra-Aortic Trunk in a Maintenance Hemodialysis Patient: A Case Report

Asmaa Bouchari[1*], Mariam El Hammouti[1], Soukaina Ben Driss Alami[1], Zakaria Khachani[2], Houda Hanafi[1], Maryam Assem[1], Sara El Maakoul[1]

[1]Department of Nephrology, Mohammed VI University Hospital Center, Tangier, Morocco
[2]Nephrologist at Al Hayat Center for Kidney Diseases and Dialysis, Tangier, Morocco
Email: *as.bouchari@gmail.com, maryam.elhammouti@gmail.com, s91.alami@gmail.com, zakariakhachani@gmail.com, houdahanafi02@gmail.com, assemmaryam5@gmail.com, saraelmkl@gmail.com

How to cite this paper: Bouchari, A., El Hammouti, M., Ben Driss Alami, S., Khachani, Z., Hanafi, H., Assem, M. and El Maakoul, S. (2025) SARS-CoV-2-Induced Thrombosis of the Supra-Aortic Trunk in a Maintenance Hemodialysis Patient: A Case Report. *Open Journal of Nephrology*, **15**, 408-413.
https://doi.org/10.4236/ojneph.2025.153038

Received: August 14, 2025
Accepted: September 13, 2025
Published: September 16, 2025

Copyright © 2025 by author(s) and Scientific Research Publishing Inc.
This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).
http://creativecommons.org/licenses/by/4.0/

Open Access

Abstract

Introduction: The COVID-19 pandemic has been associated with an increased incidence of arterial and venous thromboses in patients undergoing maintenance hemodialysis, leading to more dialysis access thromboses. **Observation:** We report the case of an 84-year-old patient undergoing hemodialysis through an arteriovenous fistula (AVF). The patient presented with clinical symptoms related to SARS-CoV-2 infection along with biological markers indicative of an infectious syndrome. A chest CT angiography revealed severe viral pneumonia consistent with COVID-19 (CO-RADS 5). The patient was hospitalized due to respiratory instability and received oxygen therapy, antibiotic treatment, corticosteroids, vitamin supplementation, and preventive anticoagulation with enoxaparin. The patient's condition was complicated by AVF thrombosis and required admission to the intensive care unit due to worsening respiratory distress. Another chest-abdomen-pelvic CT angiography conducted one month later revealed thrombosis of the supra-aortic trunk. This rare complication made any new vascular access for dialysis impossible due to the patient's non-operability for the creation of a complex access site. One month later, the patient died of a pulmonary embolism. **Conclusion:** Given the severity of post-COVID-19 thromboembolic events in hemodialysis patients, particularly those hospitalized in intensive care, a low threshold of suspicion should be maintained for early screening. Treatment is urgent due to the functional and vital risks. An adaptation of anticoagulation protocols for this population could be considered to avoid such severe complications.

Keywords

Thrombosis, Supra-Aortic Trunk, Maintenance Hemodialysis, SARS-CoV-2

1. Introduction

According to the World Health Organization, the COVID-19 pandemic, caused by SARS-CoV-2, has led to a major health crisis responsible for very high morbidity worldwide [1]. Respiratory involvement in COVID-19 is frequently observed and can progress to acute respiratory distress syndrome (ARDS), potentially resulting in death. This is particularly noted in patients with comorbidities such as hypertension, diabetes, renal failure, and cancer [2]. Since its emergence, millions of people have been affected by the disease, most of whom recover without reported sequelae [3]. However, several thromboembolic events (TEEs) have been reported, such as deep vein thrombosis (DVT) and pulmonary embolism (PE) [4]. This can be explained by stasis due to bed rest and obesity, endothelial injury caused by inflammation, and hypercoagulability secondary to sepsis [5].

In maintenance hemodialysis (MHD) patients infected with SARS-CoV-2, various thromboembolic complications have been reported, including thrombosis of the vascular access, as well as atypical venous thromboses in terms of presentation and location [6].

We report the case of an MHD patient with COVID-19 infection complicated by thrombosis of the supra-aortic trunk (SAT).

2. Case Report

We report the case of an 84-year-old obese patient (BMI of 35 kg/m^2) with a medical history of end-stage chronic kidney disease (ESCKD) due to reflux nephropathy. He had been undergoing hemodialysis for four years via a cephalic arteriovenous fistula (AVF). The patient was hospitalized for the management of COVID-19 pneumonia.

Biological tests revealed an infectious syndrome characterized by neutrophilic leukocytosis (75% neutrophils), lymphopenia (810 cells/μL), elevated C-reactive protein, and thrombocytosis (platelets at 511,000/mm^3). A chest CT angiography was performed, showing bilateral pleural effusion, more pronounced on the left side, and pneumonia affecting more than 50% of the pulmonary parenchyma, consistent with COVID-19 pneumonia (CO-RADS 5).

The patient's condition deteriorated, with worsening respiratory status requiring transfer to the intensive care unit where he was initially placed in the prone position to improve oxygenation. He received high-concentration oxygen therapy via a mask, antibiotic treatment with azithromycin for 3 days followed by amoxicillin-clavulanic acid, corticosteroid therapy at 1 mg/kg/day for 7 days, and prophylactic anticoagulation with enoxaparin.

A few days later, he developed upper limb edema, which revealed thrombosis of his arteriovenous fistula (AVF). Two attempts to insert central venous catheters—femoral and jugular—were unsuccessful. A thoraco-abdomino-pelvic CT angiography was subsequently performed, revealing thrombosis of the supra-aortic trunk (SAT) (**Figure 1**).

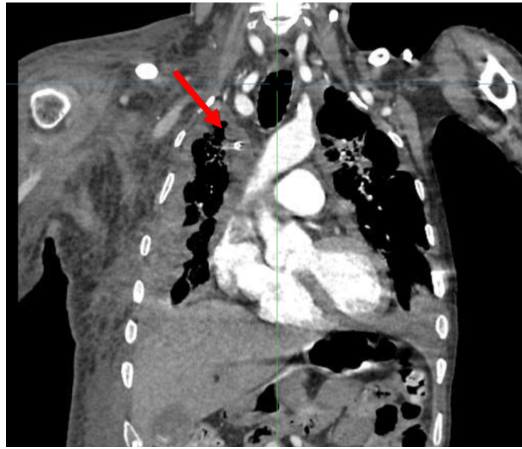

Figure 1. The frontal slice of the chest CT angiography shows a thrombus in the supra-aortic trunk.

This complication rendered the creation of a new vascular access impossible due to thrombosis of the vessels and the patient's inoperability, resulting in the suspension of hemodialysis sessions. One month later, the patient died of a pulmonary embolism.

3. Discussion

COVID-19 is well-documented for inducing a prothrombotic state that can lead to serious thromboembolic events (TEEs). Several studies have shown that arterial and venous thromboses are common in hospitalized COVID-19 patients, particularly those in intensive care units [7]. These complications have primarily been reported in patients with severe forms of the disease [8]. Severe COVID-19 is associated with a hypercoagulable state that promotes thrombus formation in both veins and arteries through multiple mechanisms. SARS-CoV-2 infects endothelial cells via the ACE2 receptor, leading to significant vascular inflammation [9]. This inflammation promotes excessive activation of platelets and coagulation factors [10].

The cytokine storm observed in COVID-19 leads to increased levels of pro-inflammatory mediators such as IL-6 and TNF-α, which activate the coagulation pathway [11]. Elevated fibrinogen and D-dimer levels are commonly observed, indicating a state of excessive coagulation and unbalanced fibrinolysis [12]. In addition, prolonged bed rest and hypoxia contribute to venous stasis, further increasing the risk of thrombosis, particularly in obese patients [7].

In our case, several factors contributed to the development of thrombosis of both the supra-aortic trunk (SAT) and the arteriovenous fistula (AVF). Chief among them was the severity of pulmonary involvement, which triggered a strong inflammatory and hypercoagulable state. Secondly, the patient had end-stage chronic kidney disease (ESCKD), a condition known to cause an imbalance between coagulation and fibrinolysis due to chronic inflammation, elevated oxidative stress, increased platelet activation, and endothelial dysfunction [13]. Thirdly, the patient

was obese, with a high BMI—an established risk factor for venous stasis that reduces blood fluidity and facilitates thrombus formation. Additionally, the requirement for prone positioning to improve oxygenation may have further impaired venous return and exacerbated circulatory stasis, particularly in the vascular access area.

The patient ultimately died of a pulmonary embolism (PE), indicating an extension of the thrombotic process and a lack of efficacy of the preventive measures taken. The SAT thrombosis likely worsened the situation by eliminating the possibility of establishing a new vascular access for dialysis, thus contributing to the patient's rapid deterioration. However, several reports have also described patients developing thrombotic events despite receiving at least prophylactic anticoagulation [7]. It is important to note that up to one-third of TEEs are diagnosed upon hospital admission and that the presence of PE increases the risk of death fivefold in ICU patients [14].

According to Hsu *et al.* (2021), the mortality rate among hemodialysis patients with COVID-19 is between 30% and 40%, significantly higher than that of the general population [15]. PE is responsible for 10% to 20% of COVID-19-related deaths [7]. Our case is consistent with findings in the literature, particularly the study by Horiuchi *et al.* (2021), which demonstrated a significantly increased risk of thromboembolic events in COVID-19 patients on hemodialysis, especially involving vascular accesses such as AVFs and catheters [16]. Rates of AVF thrombosis as high as 30% have been reported in hemodialyzed COVID-19 patients [17].

SAT thrombosis is a rare complication of COVID-19. However, several studies have reported thrombi in unusual locations, including carotid artery thromboses, aortic occlusions, and even internal jugular vein thromboses extending into the superior vena cava [18].

Regarding the management and perspectives raised by this case, although the patient received prophylactic anticoagulation, earlier initiation of therapeutic anticoagulation might have been beneficial, especially following the AVF thrombosis, by potentially preventing the extension of the thrombus. This highlights the importance of enhanced monitoring of COVID-19 patients on dialysis through early screening for thromboembolic complications using vascular Doppler or CT angiography. In such cases, a multidisciplinary approach and alternative options such as peritoneal dialysis should be considered. This technique could help avoid central venous access in patients with extensive thrombosis.

4. Conclusion

This case highlights the severity of thrombotic complications in hemodialysis patients with COVID-19, where hypercoagulability and pre-existing vascular dysfunction create a high-risk setting. This underscores the importance of close monitoring for early detection of such complications. Prompt treatment is essential due to the risk of vascular access thrombosis and death. Adapting anticoagulation protocols specifically for this patient population may be necessary to prevent these

serious complications.

Acknowledgements

The authors would like to express their deepest gratitude to their professors for their active participation in all stages of this work, their invaluable guidance, continuous support, and constructive advice throughout the course of this work. Their expertise, encouragement, and commitment to excellence have been a constant source of inspiration.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] World Health Organization (WHO) (2020) COVID-19 Situation Reports. WHO. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports%20Organisation%20Mondiale%20de%20la%20Sant%C3%A9

[2] Ng, W.H., Tipih, T., Makoah, N.A., Vermeulen, J., Goedhals, D., Sempa, J.B., *et al.* (2021) Comorbidities in Sars-Cov-2 Patients: A Systematic Review and Meta-Analysis. *mBio*, **12**, e03647-20. https://doi.org/10.1128/mbio.03647-20

[3] World Health Organization (WHO) (2023) Coronavirus Disease (COVID-19): Post COVID-19 Condition. WHO. https://www.who.int/news-room/fact-sheets/detail/post-covid-19-condition-(long-covid)

[4] Poissy, J., Goutay, J., Caplan, M., Parmentier, E., Duburcq, T., Lassalle, F., *et al.* (2020) Pulmonary Embolism in Patients with COVID-19: Awareness of an Increased Prevalence. *Circulation*, **142**, 184-186. https://doi.org/10.1161/circulationaha.120.047430

[5] Ackermann, M., Verleden, S.E., Kuehnel, M., Haverich, A., Welte, T., Laenger, F., *et al.* (2020) Pulmonary Vascular Endothelialitis, Thrombosis, and Angiogenesis in COVID-19. *New England Journal of Medicine*, **383**, 120-128. https://doi.org/10.1056/nejmoa2015432

[6] Basile, C., Combe, C., Pizzarelli, F., Covic, A., Davenport, A., Kanbay, M., *et al.* (2020) Recommendations for the Prevention, Mitigation and Containment of the Emerging Sars-Cov-2 (COVID-19) Pandemic in Haemodialysis Centres. *Nephrology Dialysis Transplantation*, **35**, 737-741. https://doi.org/10.1093/ndt/gfaa069

[7] Klok, F.A., Kruip, M.J.H.A., van der Meer, N.J.M., Arbous, M.S., Gommers, D.A.M.P.J., Kant, K.M., *et al.* (2020) Incidence of Thrombotic Complications in Critically Ill ICU Patients with COVID-19. *Thrombosis Research*, **191**, 145-147. https://doi.org/10.1016/j.thromres.2020.04.013

[8] Lazzez, R., Toumi, S., Ben Achour, N., Chaker, H., Jaziri, A., Aguerbi, I., *et al.* (2021) Vascular Access in Hemodialysis during the COVID-19 Era, Sfax, Tunisia. *Néphrologie & Thérapeutique*, **17**, 415-421.

[9] Varga, Z., Flammer, A.J., Steiger, P., Haberecker, M., Andermatt, R., Zinkernagel, A.S., *et al.* (2020) Endothelial Cell Infection and Endotheliitis in COVID-19. *The Lancet*, **395**, 1417-1418. https://doi.org/10.1016/s0140-6736(20)30937-5

[10] Tang, N., Bai, H., Chen, X., Gong, J., Li, D. and Sun, Z. (2020) Anticoagulant Treatment Is Associated with Decreased Mortality in Severe Coronavirus Disease 2019 Patients with Coagulopathy. *Journal of Thrombosis and Haemostasis*, **18**, 1094-1099.

https://doi.org/10.1111/jth.14817

[11] Jose, R.J. and Manuel, A. (2020) COVID-19 Cytokine Storm: The Interplay between Inflammation and Coagulation. *The Lancet Respiratory Medicine*, **8**, e46-e47. https://doi.org/10.1016/s2213-2600(20)30216-2

[12] Zhou, F., Yu, T., Du, R., Fan, G., Liu, Y., Liu, Z., *et al.* (2020) Clinical Course and Risk Factors for Mortality of Adult Inpatients with COVID-19 in Wuhan, China: A Retrospective Cohort Study. *The Lancet*, **395**, 1054-1062. https://doi.org/10.1016/s0140-6736(20)30566-3

[13] Sang, Y., Tang, Y., Zhu, P., Li, L., Li, X. and Zhao, S. (2021) Thrombosis in Patients with COVID-19: A Clinical Challenge. *Frontiers in Cardiovascular Medicine*, **7**, Article ID: 626924.

[14] Klok, F.A., Kruip, M.J.H.A., van der Meer, N.J.M., Arbous, M.S., Gommers, D., Kant, K.M., *et al.* (2020) Confirmation of the High Cumulative Incidence of Thrombotic Complications in Critically Ill ICU Patients with COVID-19: An Updated Analysis. *Thrombosis Research*, **191**, 148-150. https://doi.org/10.1016/j.thromres.2020.04.041

[15] Hsu, C.M., Weiner, D.E., Aweh, G., Salenger, P., Johnson, D.S. and Lacson, E. (2021) COVID-19 among US Dialysis Patients: Risk Factors and Outcomes from a National Dialysis Provider. *American Journal of Kidney Diseases*, **77**, 748-756.e1.

[16] Horiuchi, D., Hoshino, J., Kaneko, M. and Fujii, N. (2021) High Incidence of Vascular Access Thrombosis in Hemodialysis Patients with COVID-19: A Multicenter Study. *Nephrology Dialysis Transplantation*, **36**, 750-757.

[17] Werner, R., Patel, P.A. and Prats, J. (2021) COVID-19 Associated Vascular Access Thrombosis in Hemodialysis Patients. *Hemodialysis International*, **25**, 350-355.

[18] Kashi, M., Jacquin, A., Dakhil, B., Zaimi, R., Mahé, E., Tella, E., *et al.* (2020) Severe Arterial Thrombosis Associated with COVID-19 Infection. *Thrombosis Research*, **192**, 75-77. https://doi.org/10.1016/j.thromres.2020.05.025