

# COVID-19 and the Coagulation Conundrum

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## Introduction

- Hypercoagulability is a known phenomenon of COVID-19.
- Patent foramen ovale (PFO) increases risk for systemic embolization of thromboembolisms during SARS-CoV-2 infection.

## Presentation

- A 41-year-old male with history of type two diabetes mellitus and recent hospitalization for COVID-19 pneumonia presents with dyspnea and left sided weakness.
- NIH Stroke Scale: 7
- Neuro exam
  - Left homonymous hemianopsia
  - Left central facial palsy
  - LUE and LLE drift
  - LUE ataxia
- Head imaging showed acute infarct of the right MCA territory.
- Deemed not a candidate for thrombolytics or mechanical thrombectomy.

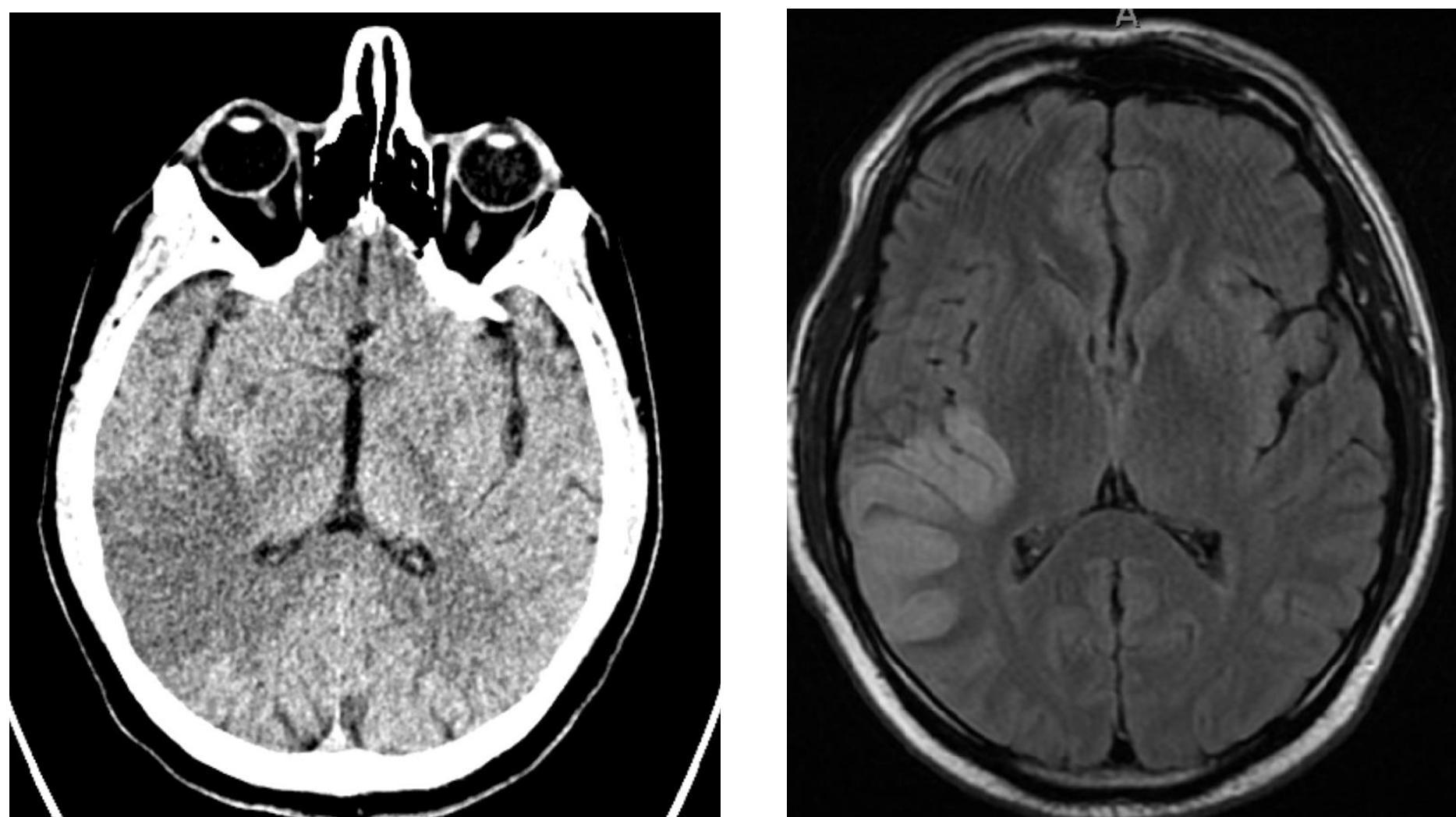


Figure 1. (Left) CT Head showing large hypodensity in temporoparietal-occipital region consistent with acute infarct of right MCA territory. (Right) Corresponding MRI Brain on T2 axial imaging.

## Progression

- Repeat CT Chest showed new bilateral pulmonary emboli.
- Lower extremity duplex revealed occlusive and nonocclusive DVT in left popliteal and left peroneal veins.
- Started on systemic heparin TIA/stroke protocol.
- Raschke protocol not utilized due to concern for hemorrhagic conversion of stroke.
- Echocardiogram with bubble study revealed PFO with right to left shunting.

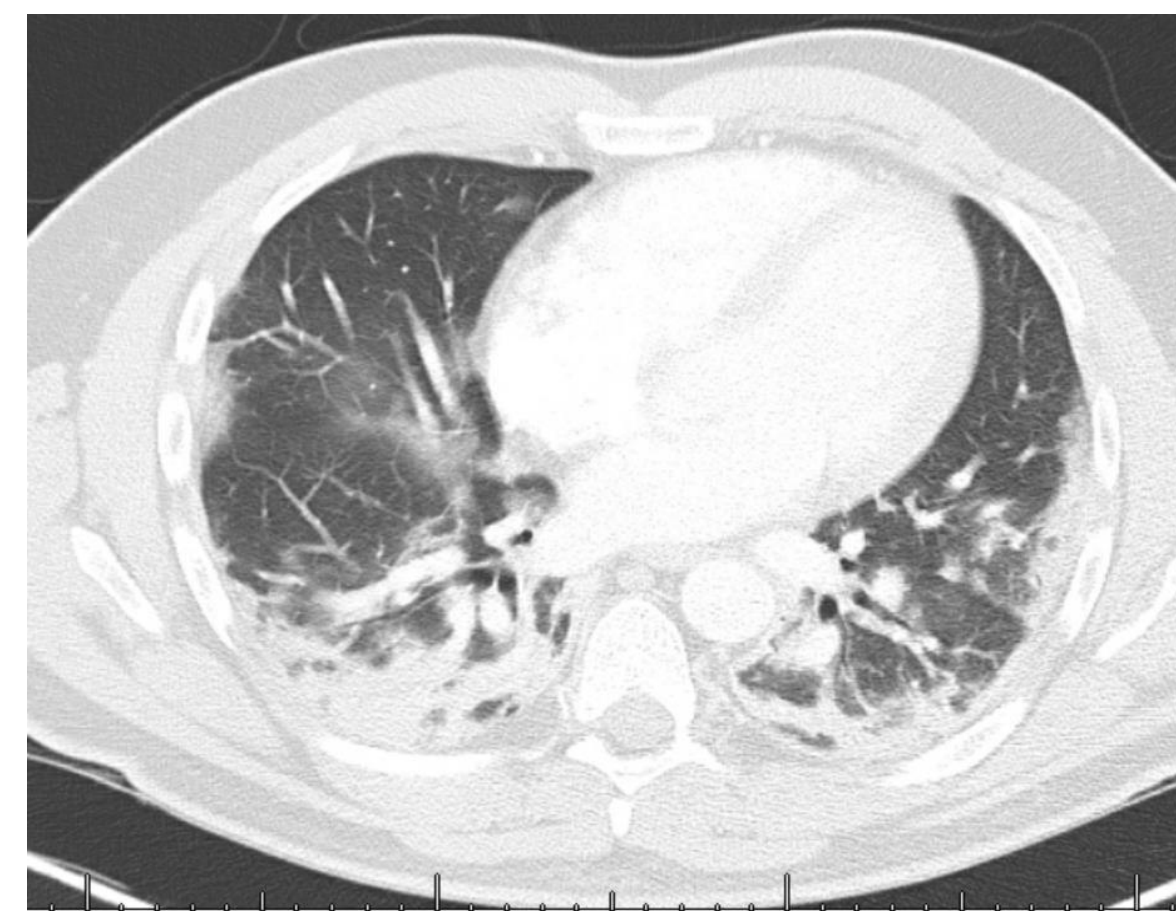


Figure 2. CT Chest demonstrating bilateral peripheral ground-glass opacities with dependent consolidations characteristic of COVID-19 pneumonia.



Figure 3. CT Chest showing bilateral pulmonary emboli in the distal right pulmonary artery and left interlobar artery.

## Outcome

- Weaned from 3 L NC to room air.
- Transitioned from systemic heparin to apixaban.
- After multidisciplinary discussion with cardiology, recommended to have PFO closure as outpatient.

## Discussion

- Incidence of venous thromboembolism is increased in COVID-19 patients.
- It is theorized that local hypercoagulability at the alveolar level spreads towards a generalized hypercoagulable state in the systemic vasculature.
- Multiple case series and retrospective analysis have demonstrated increased incidence of ischemic stroke in patients under 50 years of age with COVID-19, perhaps in part due to PFO's.
- There is limited data on patients with strokes associated with PFO's in COVID-19 patients.
- Closure of PFO to prevent further strokes and continued hypoxemia is appropriate in this patient subgroup.

## Conclusion

It is likely beneficial to screen specific patients with SARS-CoV-2 for PFO via echocardiogram. Optimum anticoagulation strategies need to be defined in hospitalized patients with SARS-CoV-2 infections, particularly in those with increased risk of systemic thromboembolism.

## References

1. Abou-Ismael MY, Diamond A, Kapoor S, Arafah Y, Nayak L. The hypercoagulable state in COVID-19: Incidence, pathophysiology, and management. *Thromb Res.* 2020 Oct;194:101-115. doi: 10.1016/j.thromres.2020.06.029. Epub 2020 Jun 20. Erratum in: *Thromb Res.* 2020 Nov 26; PMID: 32788101; PMCID: PMC7305763.
2. Helms J, Tacquard C, Severac F, Leonard-Lorant I, Ohana M, Delabranche X, Merdji H, Clere-Jehl R, Schenck M, Fagot Gandet F, Fafi-Kremer S, Castelain V, Schneider F, Grunebaum L, Anglés-Cano E, Sattler L, Mertes PM, Meziani F; CRICS TRIGGERSEP Group (Clinical Research in Intensive Care and Sepsis Trial Group for Global Evaluation and Research in Sepsis). High risk of thrombosis in patients with severe SARS-CoV-2 infection: a multicenter prospective cohort study. *Intensive Care Med.* 2020 Jun;46(6):1089-1098. doi: 10.1007/s00134-020-06062-x. Epub 2020 May 4. PMID: 32367170; PMCID: PMC7197634.
3. Oxley TJ, Mocco J, Majidi S, Kellner CP, Shoirah H, Singh IP, De Leacy RA, Shigematsu T, Ladner TR, Yaeger KA, Skliut M, Weinberger J, Dangayach NS, Bederson JB, Tuhrim S, Fifi JT. Large-Vessel Stroke as a Presenting Feature of Covid-19 in the Young. *N Engl J Med.* 2020 May 14;382(20):e60. doi: 10.1056/NEJMc2009787. Epub 2020 Apr 28. PMID: 32343504; PMCID: PMC7207073.
4. Panigada M, Bottino N, Tagliabue P, Grasselli G, Novembrino C, Chantarangkul V, Pesenti A, Peyvandi F, Tripodi A. Hypercoagulability of COVID-19 patients in intensive care unit: A report of thromboelastography findings and other parameters of hemostasis. *J Thromb Haemost.* 2020 Jul;18(7):1738-1742. doi: 10.1111/jth.14850. Epub 2020 Jun 24. PMID: 32302438.
5. Rigatelli G, Zuin M. Managing patent foramen ovale in COVID-19 patients during and after viral infection: an unresolved matter. *J Cardiovasc Med (Hagerstown).* 2021 Apr 1;22(4):259-260. doi: 10.2459/JCM.0000000000001163. PMID: 33633040.