

Title: Spectrum of Cardiac Involvement in COVID-19

Introduction: COVID-19 infections continue to rise worldwide. According to one report from Wuhan, China, cardiac manifestations are reported in 20% of all hospitalized patients with COVID-19.(1) Less is known about the susceptibility and clinical phenotypes among cases with cardiac involvement. We report two cases of rapidly progressive fulminant COVID-19 myocarditis with varied symptomatology, physical exam, laboratory and imaging findings.

Case descriptions: 65-year-old patient A had a more typical presentation including respiratory distress, chest pain, ST-segment elevations on EKG, lymphopenia, elevated levels of inflammatory markers and cardiac troponin-I. She had a rapid progression of multi-organ system failure leading to her death within 24 hours from presentation on maximal inopressor support. 34-year-old patient B presented with shortness of breath and chest pain like patient A, however, had isolated cardiac involvement with systolic dysfunction, and acute pericardial effusion causing tamponade. Inflammatory marker and troponin-I levels were within normal range. She is one of few reported cases of cardiac tamponade and VA-ECMO use in COVID-19 who underwent pericardiocentesis leading to complete recovery in systolic function within 3 weeks from initial presentation.

Discussion: While there have been reports of troponin elevation and ST-segment elevations on EKG without epicardial coronary artery disease and with non-fatal myocarditis, isolated cardiovascular involvement with fulminant myocarditis and cardiac tamponade are rarely reported complications of COVID-19 infections.(2-6) Additionally, inflammation and cytokine release through direct and indirect mechanisms have been implicated in myocardial injury, however, as reported above Ms. B continued to have inflammatory markers within normal range despite florid myo-pericardial disease.(7-9) Adding to rarity in this case, Ms. B is one of few reported cases who tolerated VA-ECMO with successful decannulation.

Conclusions: Isolated myocardial dysfunction and pericardial effusions in COVID-19 may have catastrophic sequelae even in the absence of elevated biomarkers described in literature.

Therefore, early detection and management of cardiac involvement is warranted. Additionally, the role of mechanical circulatory support devices and VA-ECMO in COVID-19 needs further investigation.

References

1. Shi S, Qin M, Shen B, Cai Y, Liu T, Yang F, et al. Association of Cardiac Injury With Mortality in Hospitalized Patients With COVID-19 in Wuhan, China. *JAMA Cardiol.* 2020.
2. Bikdeli B, Madhavan MV, Jimenez D, Chuich T, Dreyfus I, Driggin E, et al. COVID-19 and Thrombotic or Thromboembolic Disease: Implications for Prevention, Antithrombotic Therapy, and Follow-up. *J Am Coll Cardiol.* 2020.
3. Dabbagh MF, Aurora L, D'Souza P, Weinmann AJ, Bhargava P, Basir MB. Cardiac Tamponade Secondary to COVID-19. *JACC Case Rep.* 2020.
4. Hua A, O'Gallagher K, Sado D, Byrne J. Life-threatening cardiac tamponade complicating myo-pericarditis in COVID-19. *Eur Heart J.* 2020.
5. Zeng JH, Liu YX, Yuan J, Wang FX, Wu WB, Li JX, et al. First case of COVID-19 complicated with fulminant myocarditis: a case report and insights. *Infection.* 2020;1-5.
6. Inciardi RM, Lupi L, Zacccone G, Italia L, Raffo M, Tomasoni D, et al. Cardiac Involvement in a Patient With Coronavirus Disease 2019 (COVID-19). *JAMA Cardiology.* 2020.
7. Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet.* 2020;395(10229):1054-62.
8. Lippi G, Plebani M. Laboratory abnormalities in patients with COVID-2019 infection. *Clin Chem Lab Med.* 2020.
9. Akhmerov A, Marbán E. COVID-19 and the Heart. *Circ Res.* 2020;126(10):1443-55.