

“Of clots and failures” A case of Covid causing STEMI and subsequent heart failure ultimately requiring LVAD

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April 7, 2022

Abstract

COVID-19 is known to cause hypercoagulable and pro-inflammatory states and increase the risk of cardiovascular events. We present a case of a 57-year-old female with prior COVID who subsequently developed a STEMI requiring LVAD due to new-onset heart failure. There are no similar reports of this cardiovascular complication in COVID-19.

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Abstract:

COVID-19 is known to cause hypercoagulable and pro-inflammatory states and increase risk of cardiovascular events. We present a case of a 57-year-old female with prior COVID who subsequently developed a STEMI requiring LVAD due to new-onset heart failure. There are no similar reports of this cardiovascular complication in COVID-19.

Key Clinical message

COVID-19 can cause a wide array of sequelae including hypercoagulability and pro-inflammatory state which increase risk of cardiovascular events including STEMI and heart failure. Patients with cardiac risk factors and prior COVID-19 with cardiac symptoms should receive appropriate screening and early symptom management to improve outcome.

Keywords : STEMI, COVID-19, Mortality, LAVD

Introduction

Hypercoagulability is a significant complication of COVID-19 infection. It can lead to life-threatening situations when hypercoagulability manifests as clot burdens in vital organ systems. Keeping a low threshold for suspecting and treating hypercoagulability induced ischemia in vital organs is a crucial strategy to minimize the morbidity and mortality associated with it. (1)

Early recognition of various uncommon presentations and complications of COVID-19 infection, subsequently leading to early management, is becoming increasingly important in recent times. We present a case of COVID-19 induced hypercoagulability leading to ST elevation myocardial infarction (STEMI) in a patient who developed cardiac failure ultimately requiring left ventricular assist device (LVAD) implantation.

Case Report

A 57-year-old female with a history of hypertension, hyperlipidemia, prior COVID-19 infection in April 2020 and was treated for the infection, who now presented to the hospital in June of 2020 with a complaint of chest pain, found to have STEMI on EKG with associated ventricular fibrillation (VF) and pulseless electrical activity arrest for 14 minutes prior to achieving ROSC (Figure 1). During CPR, the patient required desynchronous cardioversion with amiodarone, lidocaine, and sodium bicarbonate. In the catheterization lab, LAD was stented and the patient was placed on extracorporeal membrane oxygenation (ECMO) for 4 days. The course was complicated by cardiogenic shock (CS) and complete heart block (CHB) for which the patient underwent automated implantable cardioverter defibrillator (AICD) implantation by electrophysiologists. She also developed bilateral hemothoraces and rib fractures as a result of CPR which required bilateral chest tube placement. Moreover, the patient developed catheter-associated *Hafnia Alvei* UTI, treated with cefepime and a short course of vancomycin until blood culture yielded.

After PCI, the patient developed severe oliguric acute kidney injury (AKI) requiring hemodialysis, shock liver, pulmonary edema and failure to wean off ventilator with progressively decreasing cardiac output thus developing CS. Post PCI transthoracic echocardiogram (TTE) revealed LVEF 27% with anteroapical and inferoseptal hypokinesis, mild to moderate mitral regurgitation and indeterminate diastolic dysfunction.

Right heart catheterization revealed severe volume overload, severe pulmonary hypertension, low cardiac output, right heart dysfunction along with echo showing severe LV dysfunction with an EF of less than 20%. Femoral intra-aortic balloon pump was placed in July 2020 and transitioned to axillary intra-aortic balloon pump 3 days later. She failed to be weaned off of the balloon pump and was seen by the heart failure team who determined to place her on LVAD. LVAD Heart Mate 3 was inserted on cardiopulmonary bypass in July 2020. Subsequent echo showed a loculated pericardial effusion that did not require intervention. After a failed extubation trial, tracheostomy was performed. At this time, she was well-diuresed with Lasix infusion followed by IV Lasix boluses while remaining on low dose epinephrine. During her post LVAD stay she

developed A. fib and was started on digoxin and amiodarone (Figure 2). In early August, she was weaned off pressors and the ventilator; the patient's symptoms improved and subsequently discharged on: amiodarone, digoxin, beta-blockers, prasugrel, warfarin, spironolactone and lisinopril.

The patient was discharged to a rehabilitation facility where her symptoms gradually improved, there her medications' better optimized and was subsequently discharged home in September 2020.

Discussion:

Cardiac injury caused by COVID-19 infection has been observed in early studies with a significantly increased risk of mortality. (2-3, 21) Increased risk of MI in the setting of a hypercoagulable state such as COVID-19, has been well documented in many cases. (4, 5) A possible pathophysiology has been reported by Esmail et al where COVID-19 causes a significant inflammatory reaction that manifest in the alveoli. The activation of epithelial cells, monocytes, and macrophages is caused by the release of inflammatory cytokines. Direct ACE2 receptor infection causes endothelial activation and dysfunction, TF expression, platelet activation, and elevated levels of vWF and FVIII, all of which contribute to thrombin production and fibrin clot formation. (6)

Specifically, cases have reported evidence for STEMI in the context of COVID-19. (7) When comparing non-COVID vs COVID STEMI patients, there is an increase in stent thrombosis and cardiogenic shock development after PCI in COVID patients. (8)

Currently, there are no published case reports in the context of COVID-19 resulting in STEMI with simultaneous cardiogenic shock leading to acute heart failure requiring LVAD.

Majority of the previous CAD cases have been found in males, whereas our report presents a female patient, suggesting sex may not be as significant of a risk factor for developing STEMI, as previously reported. (3,4) The cardiac risk factors in our patient were hypertension and hyperlipidemia, which are known risk factors for developing ACS; a similar trend has been observed in previously published reports (9). The patient in our study presented with VF, AKI, CS, and CHB; similar findings have been observed in previously published COVID-19 reports (1,4,10-12). Heart failure (HF) is most prevalent, accounting for 20% of outcomes among STEMI patients during the pandemic; these findings support our case of developing HF during hospitalization. (13) HF requiring LVAD implantation in a COVID non-STEMI patient has been reported, with a proposed algorithm for elective and urgent implantation based on coagulation and inflammatory markers (14). In our case, given the increased inflammatory burden and cardiac risk factors, it is important to approach with a higher index of suspicion of the common complications of STEMI.

These complications are life-threatening and require immediate management and interventions, as in our case where the patient first required PCI with LAD stent placement subsequently placed on ECMO. After further complications, the patient underwent AICD implantation and ultimately after worsening HF required LVAD. Similar findings and management for STEMI patients have been reported (15). Recent reports show cardiovascular complications of stent thrombosis and cardiogenic shock development after PCI in COVID-19 patients with STEMI in comparison to non-COVID 19 patients (16). One large multicenter study found that LVAD implantation is an effective management strategy and should be considered early for patients with myocardial infarction and low output states who do not respond to medical therapy. (17) Medical teams must be cognizant of these adverse events to efficiently identify and implement guidelines issued by European society of Cardiology (ESC) and American Heart Association (AHA), And American College of Cardiology (ACC) for appropriate management to reduce mortality (18-20).

Conclusion:

Hypercoagulability and severe inflammatory stress leading to life-threatening illness is a significant complication of COVID-19 infection. There should be a low threshold of suspecting and treating hypercoagulability and inflammation-induced myocardial ischemia and injury with cardiogenic shock. Early recognition and management would be an appropriate strategy to decrease acute as well as chronic morbidity and mortality.

Acknowledgment : None Declared by authors

Source of funding: None

Authors contribution:

Zauraiz Anjum, David Song, Sidra Naz, Vaibhav Shah, Saifur Rehman, Devesh Rai, Nishan Babu Pokhrel, Vikash Jaiswal: **Writing original draft**; David Song, Vikash Jaiswal, Vaibhav Shah:

Writing-review and editing the final draft

Ethical statement:

Our institution does not require ethical approval for reporting individual cases or case series.

Patient Consent:

Verbal and written informed consent was obtained from the patient for their anonymized information to be published in this article.

Declaration of conflict of interest:

None

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Figure legends

Figure 1: EKG showing STE on lead II, III, aVF and V2-V6 suggestive of anterior-inferior STEMI

Figure 2: EKG showing post LVAD Atrial Fibrillation

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