

# Avoidance of ST-Segment-Elevation Myocardial Infarction Treatment for >1 Week Due to COVID-19 Fears

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*During the coronavirus disease 2019 (COVID-19) pandemic, social distancing guidelines have negatively affected the care-seeking behavior of patients with chronic medical conditions, including those with cardiovascular disease. We report the case of a 60-year-old man with vague gastrointestinal symptoms who waited more than 1 week to seek treatment for fear of COVID-19 infection. On presentation at another hospital, he was found to have had an anterior myocardial infarction, and he underwent percutaneous coronary intervention to stent an occluded proximal left anterior descending coronary artery. Subsequently, the patient experienced refractory cardiogenic shock and, during his transfer to our hospital, refractory ventricular tachycardia, which ultimately proved fatal. (Tex Heart Inst J 2021;48(4):e207390)*

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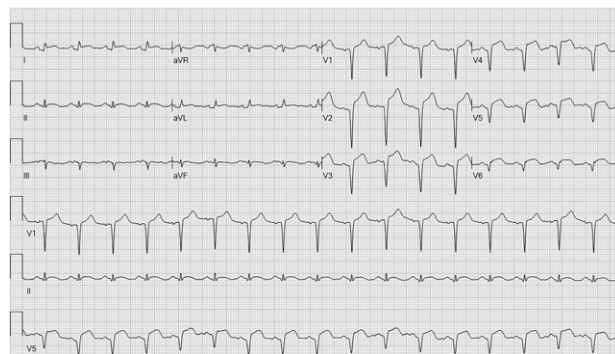
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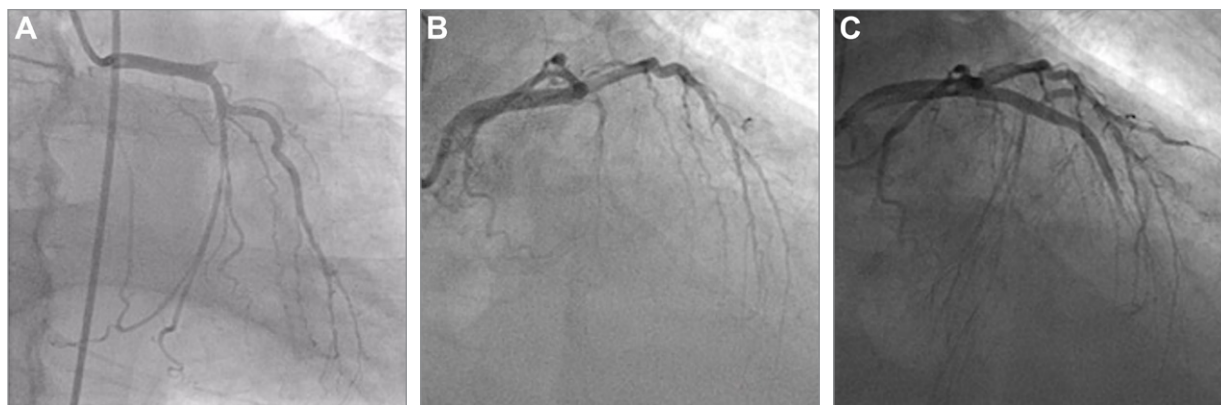
**D**uring the coronavirus disease 2019 (COVID-19) pandemic, guideline-driven social distancing has helped reduce COVID-19 transmission, with inadvertent negative consequences.<sup>1</sup> Some patients with chronic medical conditions, including cardiovascular disease, have been reluctant to seek timely medical attention for fear of becoming infected with COVID-19. This behavior has raised concerns about the detrimental consequences for patients who have heart attacks or strokes but do not seek immediate medical care.<sup>2</sup> We report the case of a man with no COVID-19 symptoms who was transferred to our hospital in refractory cardiogenic shock due to late-presenting acute myocardial infarction (MI).

## Case Report

In April 2020, a 60-year-old man with a history of essential hypertension presented at another hospital with a 2-week history of progressively worsening nausea, vomiting, indigestion, and fatigue. The patient reported that he and his family members had been practicing social distancing for weeks, but that he had delayed seeking medical attention for fear of COVID-19 infection. He had no COVID-19 symptoms. An electrocardio-



**Fig. 1** Electrocardiogram shows anterior Q waves and ST-segment elevation in precordial leads V<sub>1</sub> through V<sub>6</sub>, which are associated with late-presenting anterior myocardial infarction.

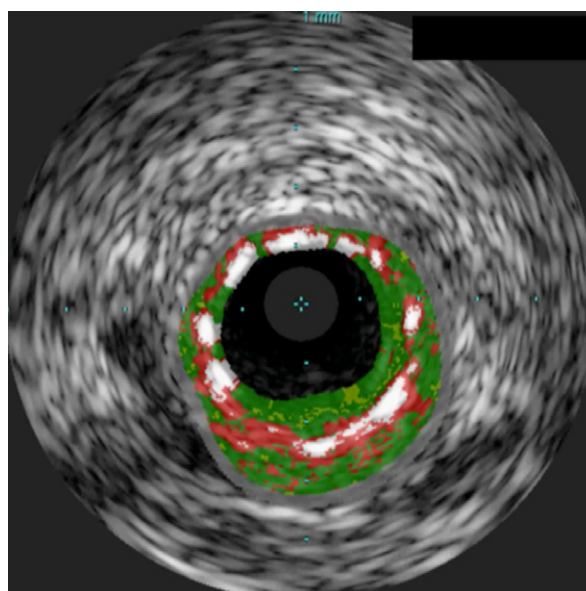


**Fig. 2** Coronary angiograms in right anterior oblique **A)** caudal and **B)** cranial views show complete occlusion of the proximal left anterior descending coronary artery before percutaneous coronary intervention (PCI). **C)** Coronary angiogram (anteroposterior cranial view) shows no residual stenosis but suboptimal flow (the no-reflow phenomenon) in the artery after PCI.

gram (ECG) showed anterior ST-segment elevation and pathologic Q waves consistent with a recent or subacute MI (Fig. 1). A coronary angiogram revealed complete occlusion of the proximal left anterior descending coronary artery (Fig. 2A–B).

The patient underwent percutaneous coronary intervention (PCI) to deploy a single drug-eluting stent in the affected artery. The procedure resulted in no residual stenosis but suboptimal flow (Thrombolysis In Myocardial Infarction grade 1), known as the no-reflow phenomenon (Fig. 2C). A virtual-histology intravascular ultrasonogram of the proximal left anterior descending coronary artery showed extensive mixed plaque composed of fibrofatty, necrotic core, and dense calcium regions (Fig. 3). Before the stenting procedure was completed, however, worsening hypotension necessitated use of vasopressors and placement of an intra-aortic balloon pump (IABP). Transthoracic echocardiograms obtained after IABP placement revealed a large left ventricular (LV) apical aneurysm, as well as severe LV dilation and systolic dysfunction, spontaneous echo contrast, and a large left pleural effusion (Fig. 4). The patient's LV ejection fraction was severely reduced. His clinical condition continued to deteriorate in the presence of ongoing end-organ hypoperfusion, which prompted the decision to transfer him to our hospital to be evaluated for mechanical circulatory support.

In transit, the patient had an episode of sustained ventricular tachycardia (VT), which was treated with intravenous amiodarone. Upon arrival at our hospital, he was lethargic but easily arousable; his mean arterial pressure was 55 to 60 mmHg, and his oxygen saturation on room air was normal. Shortly thereafter, a VT storm necessitated administration of multiple antiarrhythmic medications and serial defibrillator shocks. The patient was then sedated, intubated, and cannulated to enable venoarterial extracorporeal membrane oxygenation as a bridge to decision. Although these initial interventions were successful, the VT was refractory, and the patient's



**Fig. 3** Virtual-histology intravascular ultrasonogram of the proximal left anterior descending coronary artery shows extensive mixed plaque composed of fibrofatty (green), necrotic core (red), and dense calcium (white) regions.

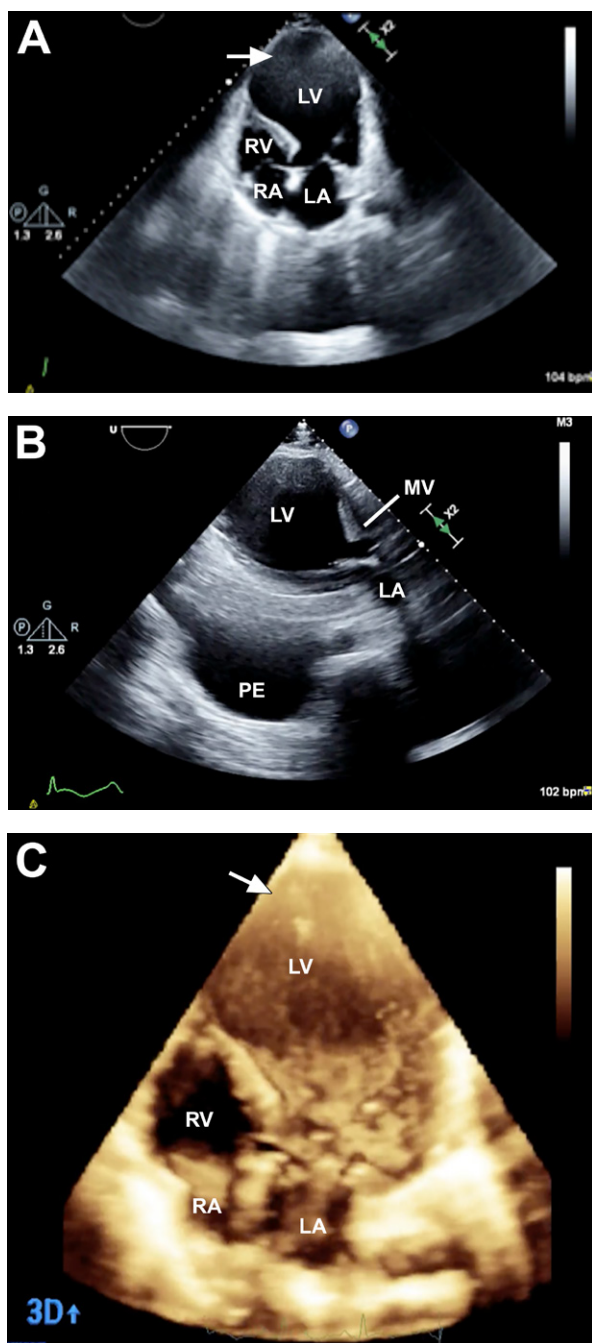
Supplemental motion image is available for [Figure 3](#).

family decided on comfort measures only. The patient died 9 days later.

## Discussion

We do not know how many people will die of untreated acute and chronic medical conditions unrelated to COVID-19 during the pandemic, but the number will likely be underappreciated. Even after the pandemic has ended, the magnitude of its unforeseen effects on the morbidity and mortality of patients without COVID-19 may never be fully realized.

In a report based on data from 9 high-volume PCI centers in the United States (US), Garcia and colleagues<sup>3</sup>



**Fig. 4** **A)** Transthoracic echocardiogram shows a 9.1-cm left ventricular (LV) aneurysm (arrow) at end-systole (apical 4-chamber view). Severe LV dilation, systolic dysfunction, and spontaneous echo contrast are seen in the **B)** parasternal long-axis view and in **C)** 3D mode. In addition, a large left pleural effusion (PE) is seen in **B**, and an aneurysm (arrow) within the LV cavity in **C**.

LA = left atrium; MV = mitral valve; RA = right atrium; RV = right ventricle

Supplemental motion images are available for [Figures 4B and 4C](#).

revealed that catheterization laboratory activations for ST-segment-elevation MI (STEMI) decreased by approximately 38% early in the pandemic. A subsequent extended analysis from the same investigators,<sup>4</sup> based

on data from a more geographically representative sample of 18 STEMI centers in the US, showed that the number of STEMI activations across regions was consistently lower, regardless of the burden of COVID-19, the measures used to curb its spread, or the levels of testing. Door-to-balloon times also increased an average of 20%. Garcia's group<sup>4</sup> posited a multifactorial cause for the decline in STEMI activations, including the avoidance of healthcare systems for fear of contracting COVID-19.

In addition, healthcare delivery systems have redistributed resources and redirected care of chronically ill outpatients by triaging their noncritical appointments, diagnostic tests, and procedures and shifting them to telemedicine consultations only.<sup>5,6</sup> A growing concern among cardiologists is the hesitance of patients to seek urgent medical care. The actual time at which our patient's acute MI occurred is unknown. However, his subjective account and the echocardiographic evidence of adverse LV remodeling suggest that it occurred 1 to 2 weeks before his initial presentation, about the time his symptoms first appeared. Similarly, given the patient's atypical report of nausea and fatigue, it is not clear whether his decision to downplay the symptoms and not present earlier—when myocardial salvage was still possible—was influenced by any lack of access to routine primary care (for example, cancellation or postponement of appointments, or no access to formal telehealth systems).

Lost in the COVID-19 pandemic is the effect of information overload, misinformation, data availability, and myths that have likely contributed to panic among patients and clinicians. A consensus statement from several medical societies outlines the care of patients presenting with acute MI during the pandemic.<sup>7</sup> The statement stresses timely intervention, as would have been expected in the absence of COVID-19, particularly in facilities equipped with appropriate personal protective equipment. It also stresses that patients experiencing acute coronary syndromes should immediately go to regional STEMI centers, and that this can be done without increasing the risk of contracting COVID-19. Efforts to minimize all conceivable sources of exposure in order to guarantee normally functioning emergency medical services have been extensive.

Much of the general public may not be aware of the breadth, scope, and effectiveness of these preventive measures. On 24 March 2020, West Virginia mandated social distancing and issued a statewide stay-at-home order. Our patient, a West Virginia resident, presented at the hospital 2 weeks after these guidelines were implemented (nearly as long as his symptoms lasted before presentation). On that same day, West Virginia had no reported deaths due to COVID-19.<sup>8</sup> To put this into perspective, 12 days later, West Virginia had a total of 26 reported deaths from COVID-19.<sup>9</sup> This pales in



comparison to the approximately 2,380 deaths per day caused by cardiovascular disease nationally.<sup>10</sup> In 2017, West Virginia ranked 10th nationally in heart disease mortality.<sup>11</sup> Undoubtedly, patient education during this pandemic is of utmost importance, especially since the risk of dying of untreated MI is substantially greater than the risk of dying of COVID-19.

This issue is not confined to the US. The European Society of Cardiology conducted an exhaustive, internet-based survey of cardiovascular healthcare providers in 141 countries spanning 6 continents to ascertain global trends in STEMI care during the COVID-19 pandemic.<sup>12</sup> Of note, more than 65% of respondents reported a greater than 40% reduction in STEMI activations. Furthermore, nearly 60% of respondents noted that more than 40% of patients with STEMI who were eventually admitted presented outside of the ideal window for PCI or thrombolytic therapy. In China, a preliminary analysis of data from a single hospital in Hong Kong and a more extensive analysis of data from more than 1,300 chest pain centers revealed decreases in overall STEMI activations and an increase in time from symptom onset to first medical contact and intervention.<sup>13,14</sup> The analysis also revealed that rates of in-hospital mortality and in-hospital heart failure actually increased during the pandemic.<sup>14</sup> However, not all countries have faced similar STEMI crises during the pandemic. A study from Taiwan showed no reduction in STEMI admissions or decrease in the quality of care delivered in the wake of the pandemic. The investigators for that study attributed these findings mainly to a concerted public health strategy that effectively blunted the pandemic's negative effects on STEMI care.<sup>15</sup>

## Conclusions

The medical and psychosocial effects of COVID-19 on the general public are far-reaching, especially in sowing fears about contracting the disease when seeking emergency medical care. This case highlights the detrimental consequences of waiting to seek care for heart attack or stroke. Medical providers, healthcare systems, and professional societies should continue to provide the public with up-to-date information and reassurance. The broader medical community should publicize the symptoms of cardiovascular disease and the importance of not waiting to seek emergency medical care. Such efforts may reduce the number of unanticipated and highly morbid strokes, heart attacks, and other associated cardiovascular insults.

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