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CASE REPORT: CLINICAL CASE SERIES

Ventricular Septal Rupture Complicating Delayed Acute Myocardial Infarction Presentation During the COVID-19 Pandemic



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ABSTRACT

The rate of mechanical complications of acute myocardial infarction has declined. Recent publications raised concerns over the reduction in cardiac catheterization laboratory activation for ST-segment myocardial infarction (STEMI) during the coronavirus disease-2019 (COVID-19) pandemic. We present 2 recent cases of ventricular septal rupture in patients who presented to our institution with delayed STEMI. (**Level of Difficulty: Intermediate.**) (J Am Coll Cardiol Case Rep 2020;2:1595-8) © 2020 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Primary percutaneous coronary intervention remains the gold standard for the management of patients presenting with ST-segment elevation myocardial infarction (STEMI) (1). Timely intervention reduces mechanical complications such as ventricular septal rupture, free wall

rupture, papillary muscle rupture, or systolic cardiomyopathy.

The rate of mechanical complications of acute myocardial infarction has declined significantly with timely percutaneous coronary intervention (2).

Recent publications raised concerns over the reduction in cardiac catheterization laboratory activation for STEMI in the United States (3) and Spain (4) during the coronavirus disease-2019 (COVID-19) pandemic. Many factors were suggested to play a role in this, mainly patients' hesitance to present to the emergency department (ED) under the concern of contracting COVID-19, as well as, health care workers' fear of contracting the disease from direct patient care.

With the delay in presentation of patients with STEMI, the rate of mechanical complications is expected to increase. We present 2 recent cases of

LEARNING OBJECTIVES

- To reiterate the potential complications of delaying seeking medical care in the era of a pandemic.
- To understand the time course of mechanical complications of acute myocardial infarction if not treated in a timely fashion.
- To educate the community about the importance of still coming to hospitals for evaluation if any concerning symptoms despite the fear of contracting COVID-19.

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the *JACC: Case Reports* [author instructions page](#).

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**ABBREVIATIONS
AND ACRONYMS**

COVID-19 = coronavirus disease-2019

ED = emergency department

LAD = left anterior descending artery

QP/QS = pulmonic/systemic flow for shunt calculation

STEMI = ST-segment myocardial infarction

TIMI = Thrombolysis In Myocardial Infarction

ventricular septal rupture in patients who presented to our institution with delayed STEMI.

PATIENT #1

A 67-year-old woman with prior left circumflex stenting developed chest pain at rest, which was not improved with nitroglycerine. She delayed seeking medical attention because of concern of contracting COVID-19 in the ED. After 14 h of pain, she presented to the ED where she was found to have inferior ST-segment elevation with Q waves (Figure 1). She was taken to the catheterization laboratory where her dominant right coronary artery was totally occluded (100% occlusion of the mid-segment with Thrombolysis In Myocardial Infarction [TIMI] flow grade 0) (Figure 2). Despite crossing the occlusion with the wire and aggressive aspiration thrombectomy, there was no return of flow (TIMI flow grade 0) and a stent was not implanted due to resolution of chest pain and late presentation. Troponin I peaked at 44 (µg/l). Echocardiogram suggested an ejection fraction of 50% with hypokinesis of the inferior and infero-septal myocardium. She was discharged home 3 days later.

Five days later, she re-presented to the ED with recurrent chest pain, shortness of breath, and hypotension with a blood pressure of 85/40 mm Hg and a heart rate of 105 beats/min. Her physical examination was consistent with a holo-systolic murmur heard across the precordium. Her electrocardiogram was unchanged and repeat echocardiogram showed an ejection fraction of 50% with an apical ventricular septal rupture with left-right shunting and pulmonic/systemic flow for shunt calculation (QP/QS): 1.6/1 (Video 1). Echo with Definity (Lantheus Medical Imaging) showed a complex interventricular septal rupture (Video 2).

Given persistent hypotension and shortness of breath, she was taken to the operating room and underwent complex ventricular septal repair (large part of the septum was necrotic). Postoperatively she developed severe right ventricular dysfunction and required implantation of a right ventricular assist device. She remains critically ill in the intensive cardiac care unit.

PATIENT #2

A 62-year-old woman with hypertension and advanced multiple sclerosis developed substernal chest pain 4 days before her presentation, associated

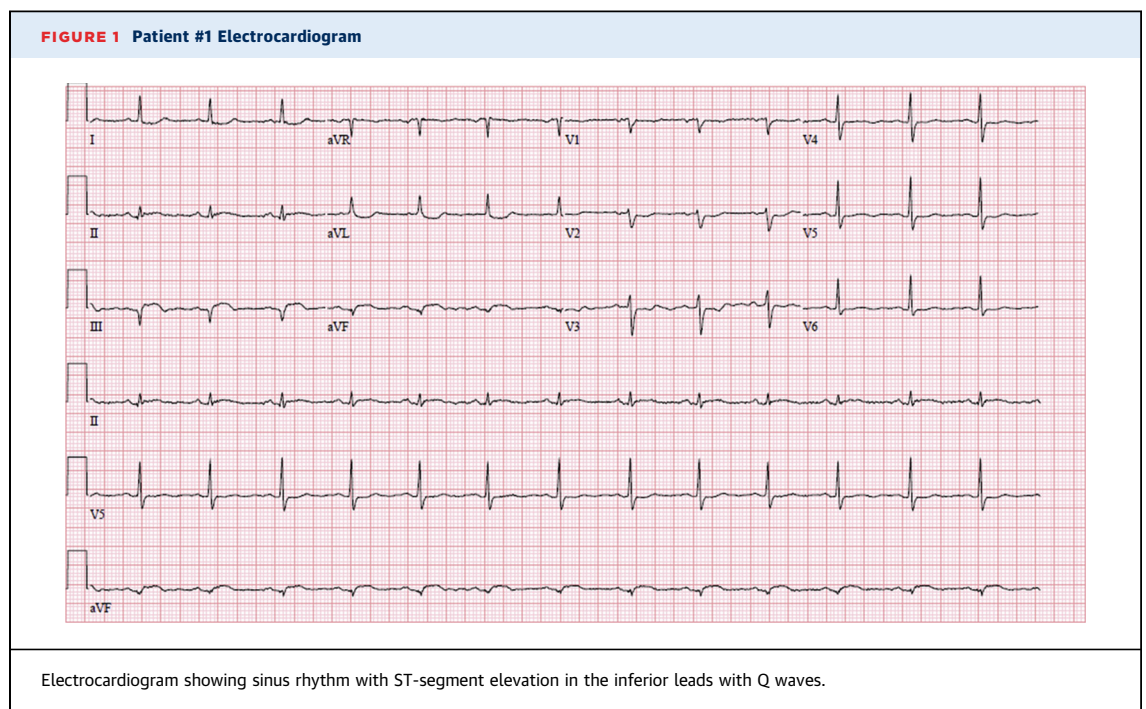
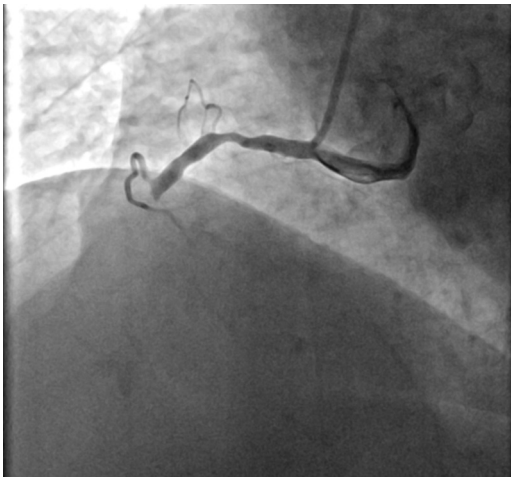


FIGURE 2 Patient #1 Angiogram



Right coronary artery selective angiography showing completely occluded vessel in the mid-segment.

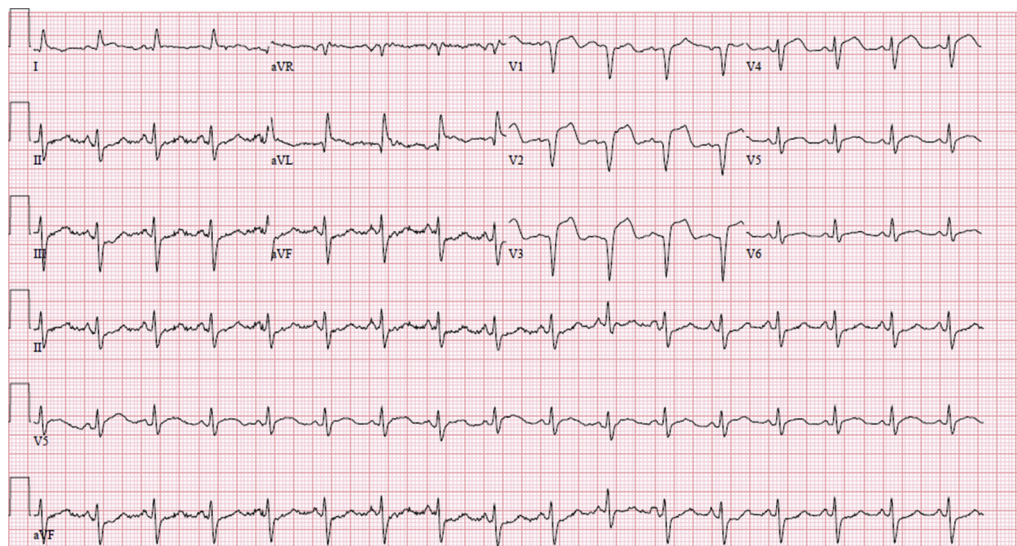
developed acute worsening of dyspnea and weakness. In the ED she was found to be hypotensive with a blood pressure of 87/55 mm Hg and a heart rate of 115 beats/min. She had a systolic thrill on cardiac examination and cool extremities. Electrocardiogram showed anterior ST-segment elevation with Q waves consistent with subacute infarct in the left anterior descending (LAD) artery territory (**Figure 3**). Echocardiogram (**Videos 3 and 4**) showed large LAD wall motion abnormality with an ejection fraction of 35% along with an apical ventricular septal rupture and a QP/QS of 1.5/1. The patient elected for noninvasive management due to severe debilitation from her multiple sclerosis and transitioned to hospice care. Her COVID-19 test done in the ED returned negative.

CONCLUSIONS

The cardiovascular community has made significant progress toward reducing cardiovascular morbidity and mortality in the past decades (5). The fear of contracting COVID-19 infection, although justified, will likely result in an increase in non-COVID morbidity and mortality caused by avoidance of the medical system. A significant increase in 911 calls and cardiac arrest at home was noted in areas highly

with dyspnea and a low-grade fever. Given the concern of contracting COVID-19, she did not present for medical care. The day of her presentation, she

FIGURE 3 Patient #2 Electrocardiogram



Electrocardiogram from the second patient consistent with ST-segment elevation in the anterior leads with Q waves present.

affected by COVID-19 (6). We suspect many of these deaths are related to untreated cardiovascular emergencies, as illustrated by our 2 cases. The total effect will be difficult to measure until after the pandemic, but in the meantime, it is imperative to educate the public and develop systems of care that minimize delays and maintain high quality. Rapid testing and


wider availability of personal protective equipment may facilitate achievement of these goals.

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REFERENCES

1. O'Gara PT, Kushner FG, Ascheim DD, et al. 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction. A report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol* 2013;61:e78-140.
2. Elbadawi A, Elgendy IY, Mahmoud K, et al. Temporal trends and outcomes of mechanical complications in patients with acute myocardial infarction. *J Am Coll Cardiol Intv* 2019;12:1825.
3. Garcia S, Albaghdadi MS, Meraj PM, et al. Reduction in ST-segment elevation cardiac catheterization laboratory activations in the United States during COVID-19 pandemic. *J Am Coll Cardiol* 2020;75:2871-2.
4. Rodríguez-Leor O, Cid-Alvarez B, Ojeda S, et al. Impacto de la pandemia de COVID-19 sobre la actividad asistencial en cardiología ntervencionista en España. *REC Interv Cardiol* 2020;2:82-9.
5. Ford ES, Ajani UA, Croft JB, et al. Explaining the decrease in U.S. Deaths from coronary disease, 1980-2000. *N Engl J Med* 2007;356:2388-98.
6. Deaths from cardiac arrest have surged in New York City. Available at: <https://www.economist.com/graphic-detail/2020/04/13/deaths-from-cardiac-arrests-have-surged-in-new-york-city>. Accessed April 26, 2020.

KEY WORDS mechanical complications, septal rupture, STEMI

 **APPENDIX** For supplemental videos, please see the online version of this paper.