CASE STUDY

Sudden Cardiac Arrest in a Young AMI Patient Following Percutaneous Revascularization

Patient Presentation

A 39-year-old male with a history of tobacco use and hyperlipidemia presented to the emergency room with chest pain. He had been experiencing chest discomfort described as dull pressure, in center of chest with radiation to throat and left arm, and admitted to diaphoresis, nausea, and vomiting.

The patient was in extremis. Cardiovascular exam revealed, +S1, S2, with an S4. Lungs were clear bilaterally. Abdomen was soft with normal bowel sounds and no tenderness. Extremities revealed 2+ pulses femorally and radially with no evidence of clubbing or edema.

His initial cardiac enzymes were elevated. A 12-lead electrocardiogram (EKG) revealed 5mm ST elevations in anterolateral leads. A STEMI involving the left anterior descending (LAD) was suspected likely occurring within the past 72 hours. He was taken emergently to the cardiac catheterization lab given his continued chest discomfort and clinical presentation.

Clinical Course

Cardiac catheterization revealed 100% occlusion of his LAD mid portion after giving off a septal perforator (Figure 1A). The left circumflex was a nondominant vessel with 30% stenosis at its mid portion. Left ventriculography revealed severe reduction in left ventricular systolic function with an ejection fraction (EF) of 25% and anteroapical hypokinesis.

A 1.5 balloon was advanced and several small inflations were made throughout the site of disease in the LAD. The vessel was opened and TIMI flow was restored. Three drug-eluting stents were deployed in the LAD from the mid portion to the proximal portion where the plaque rupture was identified (Figure 1B). Subsequent angiography revealed good results with 15% residual stenosis in the mid portion. A noncompliant balloon was inflated within the aforementioned stents including the overlapping regions to ensure adequate apposition to the vessel wall. Subsequent angiography revealed good results (Figure 1C). A 60-70%

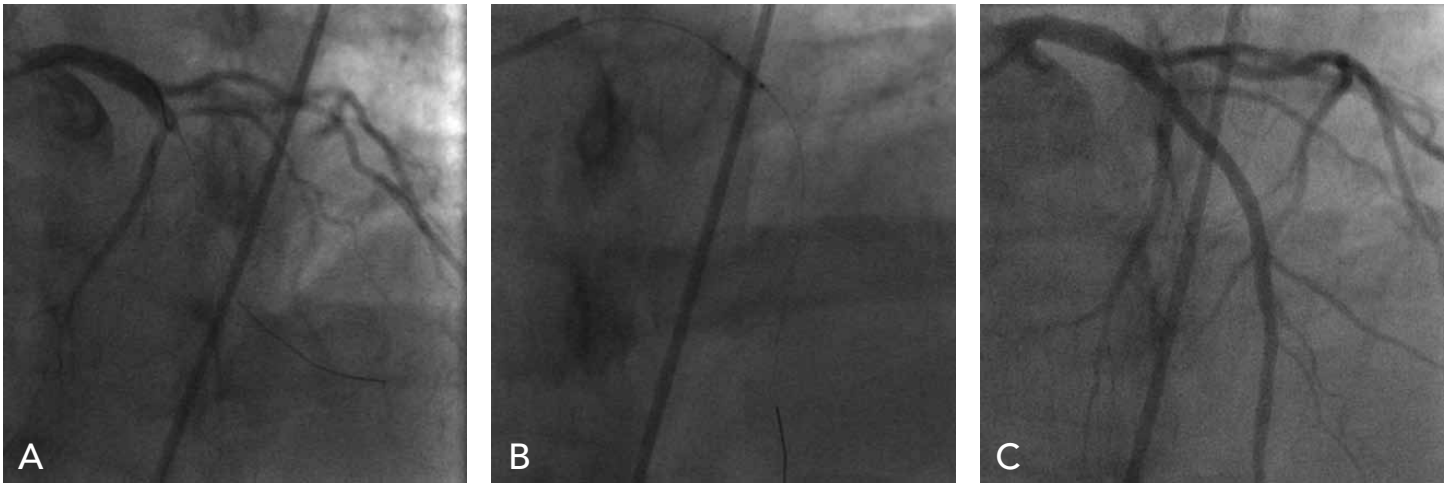

Figure 1. Cardiac angiography (A) pre-, (B) during, and (C) post-three stent deployment in the patient's LAD.

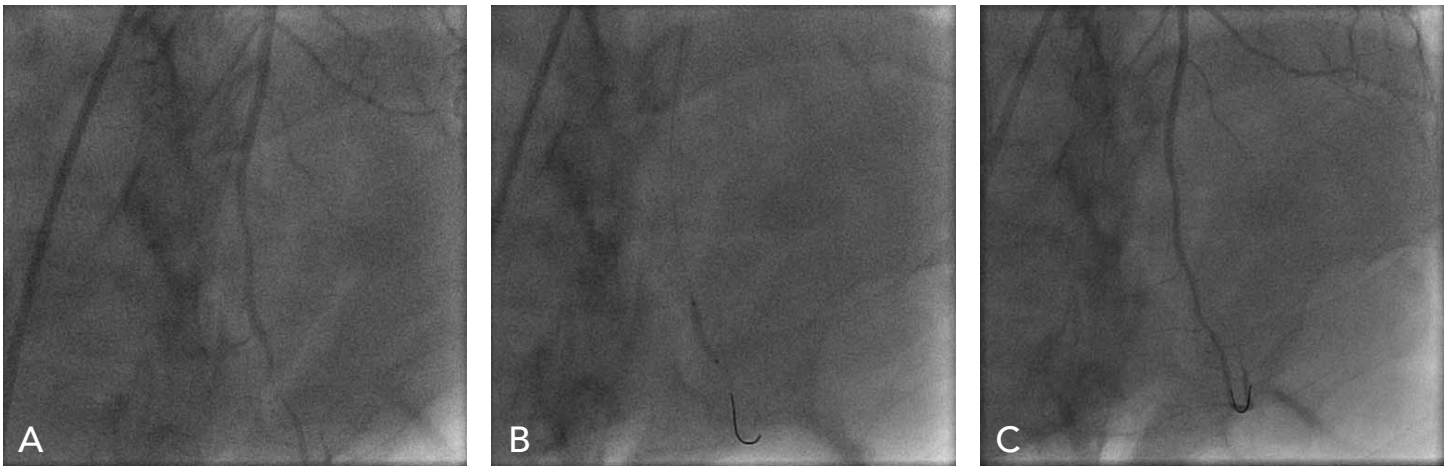

Figure 2. Angiography post-stent deployment revealed distal LAD stenosis (A) and subsequent balloon angioplasty was successfully performed (B and C).

distal area of stenosis was noted, but given the distal location, it was decided not to attempt revascularization.

The patient was transferred to the CCU and prescribed aggressive medical management including antiplatelet, beta blocker, ACE inhibitor, and statin therapies. A two-dimensional echo was ordered in 4 weeks. He would be referred to electrophysiology for ICD consult if his EF did not improve at that time. The next day while still hospitalized, the patient began experiencing diaphoresis and was hypotensive. He was again emergently brought back to the cardiac catheterization lab. Angiography revealed that the three proximal stents placed the previous day were widely patent as well as the fourth stent. The distal portion of the LAD had a 60-70% area of stenosis (Figure 2A).

It was hypothesized that the distal stenosis may be contributing to his symptoms and therefore it was decided to perform revascularization. Balloon angioplasty was performed and revealed an improvement in the area of stenosis with a remaining 10-20% residual stenosis (Figure 2B). Due to multiple factors including the size and distal location of the stenosis, the patient's abnormal left ventricular systolic dysfunction, and the patient's current condition, further interventions on the coronary arteries were aborted (Figure 2C).

Post-angioplasty the patient was still hypotensive despite dopamine therapy. Given the left ventricular systolic dysfunction, a right heart catheterization to measure the wedge pressure was performed and revealed the following:

Pressures:
Pulmonary artery 34/20/26.
Pulmonary capillary wedge pressure of 17mmHg.

Saturations:
Aorta 95%.
Pulmonary artery 71%.

Because the patient appeared to be in cardiogenic shock, a left ventricular assist device was placed. The patient was sent to the CCU on continued antithrombin therapy. He was ordered a wearable cardioverter defibrillator (WCD, ZOLL, Pittsburgh, PA) before discharge. The patient continued to improve and 4 days later the patient was discharged from the hospital.

Five days after being discharged, the patient experienced an episode of ventricular tachycardia (VT) at a rate of 204 beats per minute (BPM) (Figure 3); the wearable defibrillator appropriately detected the episode, and started broadcasting alarms. The patient was conscious and initially pressed the response buttons to delay the treatment shock.

The patient then fell unconscious and the WCD delivered a 150J biphasic treatment shock. The treatment successfully converted his VT to bradycardia at a rate of 46 BPM (Figure 4). The patient's friend drove him to the hospital.

When in the emergency room, the patient experienced several runs of non-sustained ventricular tachycardia. The patient was started on amiodarone and admitted to CCU. He then underwent angiography which revealed patent LAD stents. Three days later, the

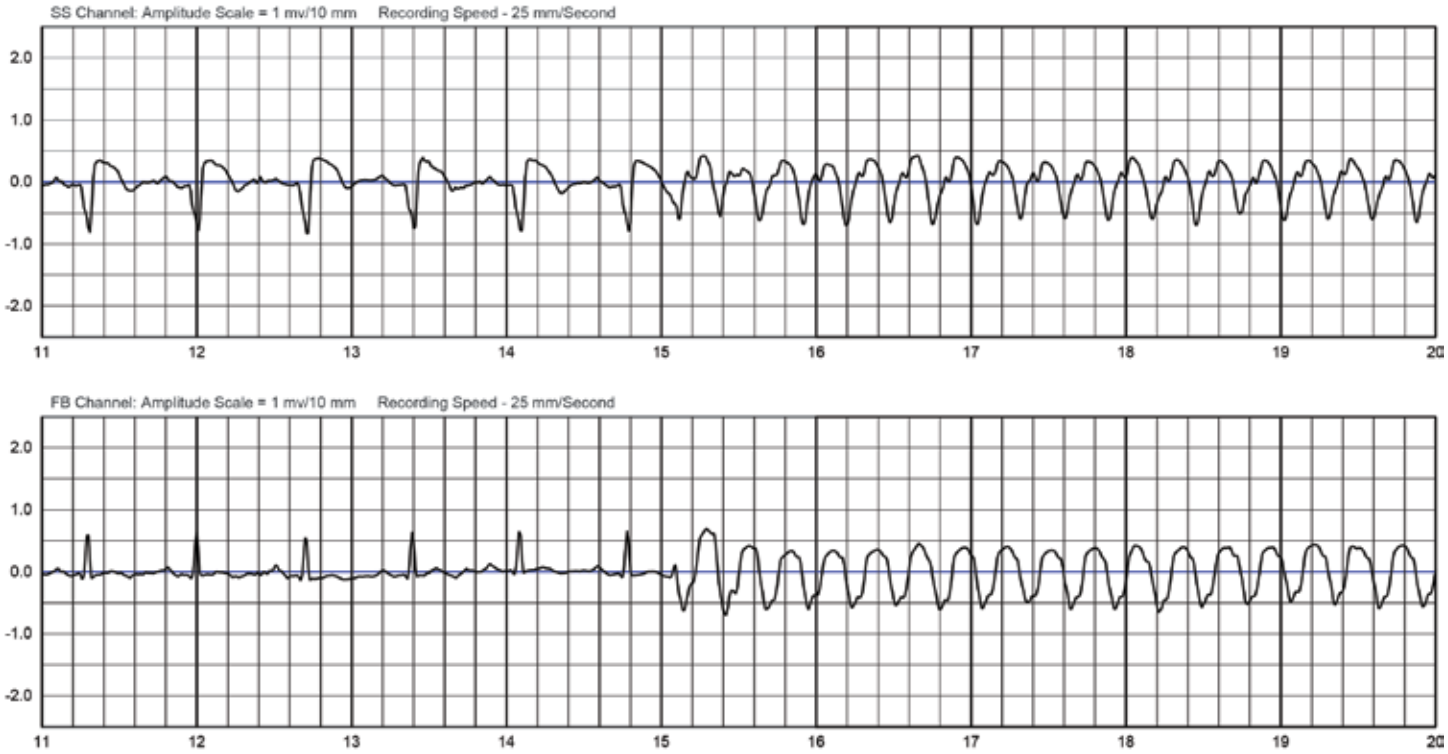

Figure 3. EKG downloaded from WCD. The WCD continuously monitors the patient's EKG using a 4 electrode, 2 lead system – side-to-side (SS, top) and front-to-back (FB, bottom). VT at a rate of 204 BPM occurred 5 days post-discharge.

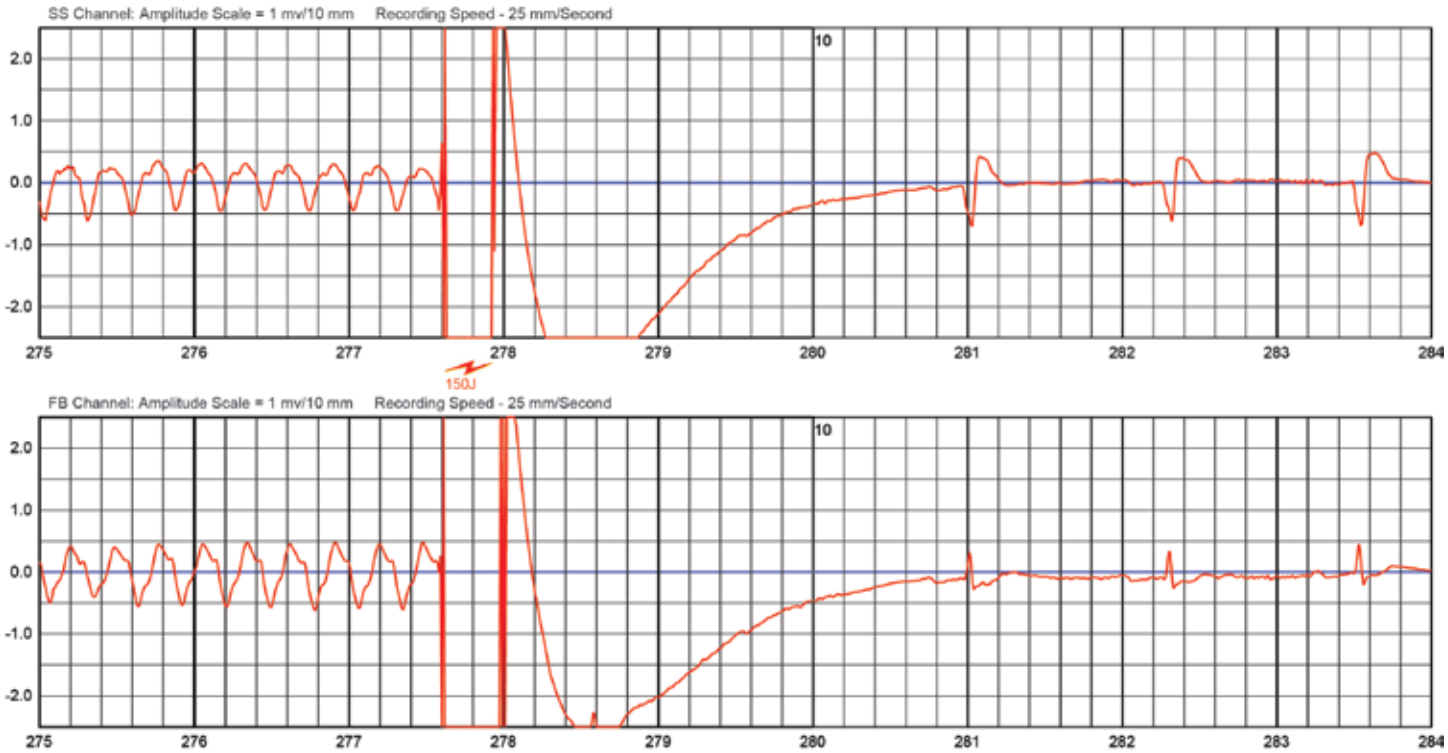

Figure 4. EKG downloaded from WCD. The WCD administered a 150 J biphasic shock that converted the patient to normal sinus rhythm.

patient received a single chamber implantable cardioverter defibrillator (ICD). The patient was discharged the following day and continues to do well.

Discussion

This patient was experiencing cardiac symptoms which he ignored for 3 days before reporting to the emergency room. He was brought emergently to the cardiac catheterization lab which resulted in a PCI procedure. The next day he was experiencing worsening symptoms and was emergently brought back to the cardiac catheterization lab due to his low EF and poor clinical status. This led to a second PCI procedure at a distal location of his LAD. This patient's long-term prognosis was guarded due to his poor cardiac function. Patients with large MIs are known to have significant risk of sudden death in the early period after the MI. Studies have shown that a low ejection fraction is the most important factor used to assess sudden cardiac arrest (SCA) risk. With an LVEF ≤35%, the patient was identified to be at risk for SCA. He was discharged 4 days later and a plan was developed to re-evaluate the risk after his condition had stabilized and he was on optimal medical therapy. A WCD was prescribed for protection of SCA during this period and did provide a lifesaving therapy. This case provides an excellent example of identifying the early risk of SCA in patients with low EF post PCI.

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