Impella 2.5™ Support During Complex PCI in a Patient With Recent Acute Systolic Heart Failure and Residual Low Ejection Fraction

BY MARK A. GRISE, MD; TYRONE J. COLLINS, MD; AND SAMIR N. PATEL, MD

KEY CLINICAL ISSUES

- Successful high-risk coronary intervention of the LAD coronary artery and RCA in a patient with significant coronary artery disease and confounding cardiac dysfunction
- Effective use of hemodynamic support to protect the patient despite heart block and resulting asystole
- Maintenance of near-normal systemic blood pressure during three PCI procedures

A 77-year-old woman presented to the catheterization laboratory at Ochsner Heart and Vascular Institute with signs of acute systolic heart failure. Her history and diagnosis included current obesity, diabetes mellitus, hypertension, and dyslipidemia.

On coronary angiography (Figures 1 and 2), the left ventricular ejection fraction (EF) was 25%, down from 60% as measured 1 year previously. There was a high-grade lesion of 95% in the mid left anterior descending (LAD) artery. The right coronary artery (RCA) was severely diseased in both the proximal and mid portions. Cardiac enzymes were positive, including a peak troponin of 15. Four hours after angiography, the patient experienced asystolic arrest and was resuscitated by advanced cardiac life support.

A cardiac surgery consult determined that the patient's low EF, recent history of cardiac arrest, and other comorbidities made her an unacceptable candidate for surgical revascularization. She was subsequently maintained on mechanical ventilation, intravenous inotropic therapy, and intra-aortic balloon pump (IABP) support in the cardiac care unit for several days before being successfully extubated and weaned from IABP support. After the patient was stabilized, the decision was made to proceed with a percutaneous coronary intervention (PCI) supported with the Impella 2.5™ circulatory support system (Abiomed, Inc.).

PROCEDURE DESCRIPTION

Thirteen days after her asystolic arrest, the stabilized patient returned to the catheterization laboratory for an Impella-supported, high-risk PCI. The Impella 2.5™ device was inserted percutaneously via the left femoral artery, and support was started on performance level 7 (P-7), with axial pump output flow of 2 to 2.1 L/min. The proximal LAD was predilated and subsequently stented with an excellent angiographic result (Figure 3).

After placement of a 0.014-inch guidewire in the RCA, the patient developed complete heart block. The heart block lasted for longer than 2 minutes, during which time Impella support was increased to P-9 with forward flows of 2.3 L/min. The patient remained conscious during the episode of complete heart block; although she had no pulsatile

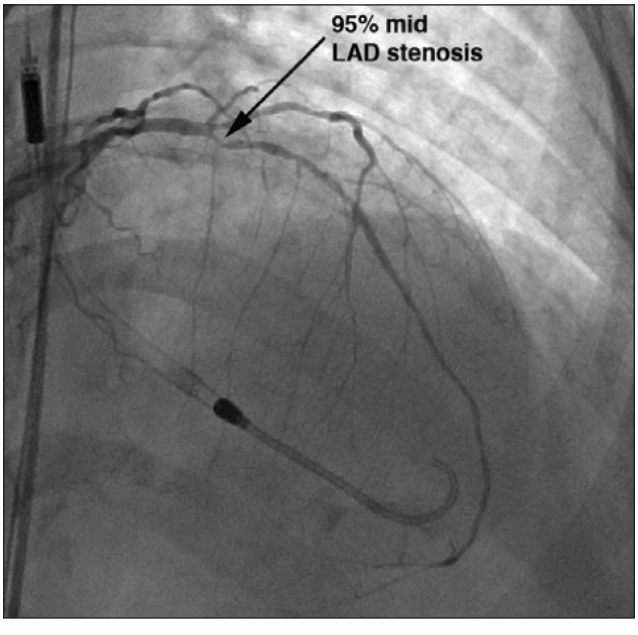

Figure 1. High-grade mid LAD stenosis.

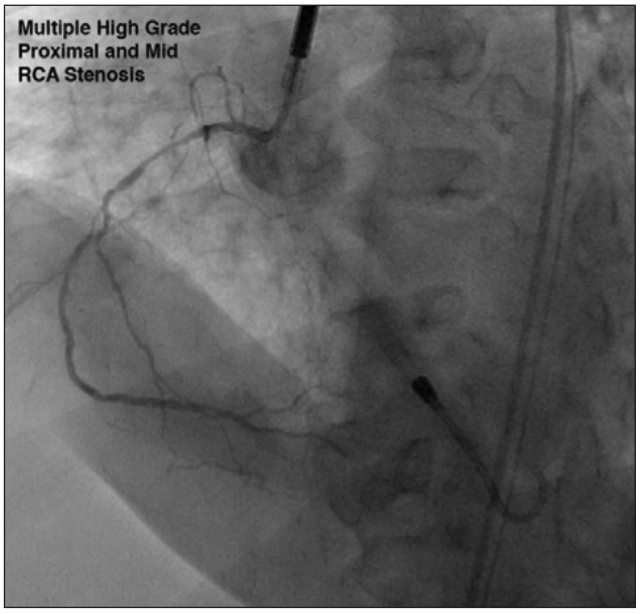

Figure 2. Multiple high-grade proximal and mid RCA stenoses.

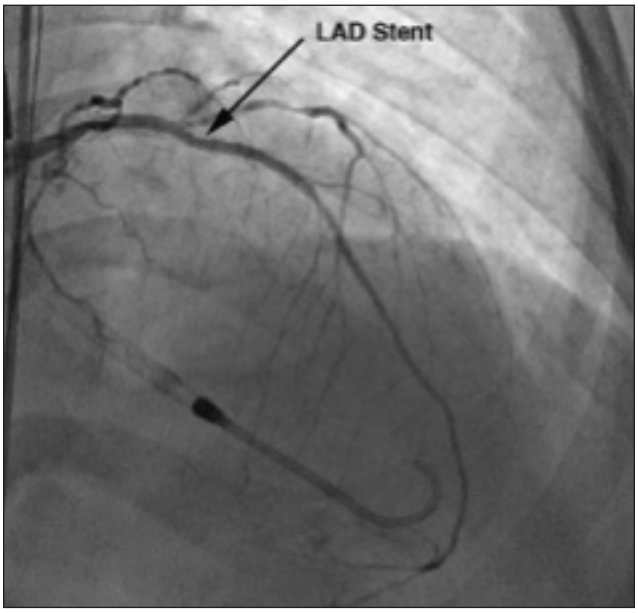

Figure 3. LAD after stent placement.

flow, her mean arterial blood pressure was maintained at 50 mm Hg by the Impella 2.5 device. With the return of sinus rhythm, atropine was administered, and her heart rate and blood pressure quickly normalized. The proximal and mid RCA lesions were each subsequently stented with a drug-eluting stent (DES) without arrhythmia onset or sudden drop in blood pressure during the PCI (Figure 4).

PATIENT FOLLOW-UP

After completion of the PCI procedures, the patient was weaned from Impella circulatory support, the device was removed, and the access site was closed with a suture-based closure device. The patient's clinical condition improved significantly over the next 24 hours, and she was subsequently discharged.

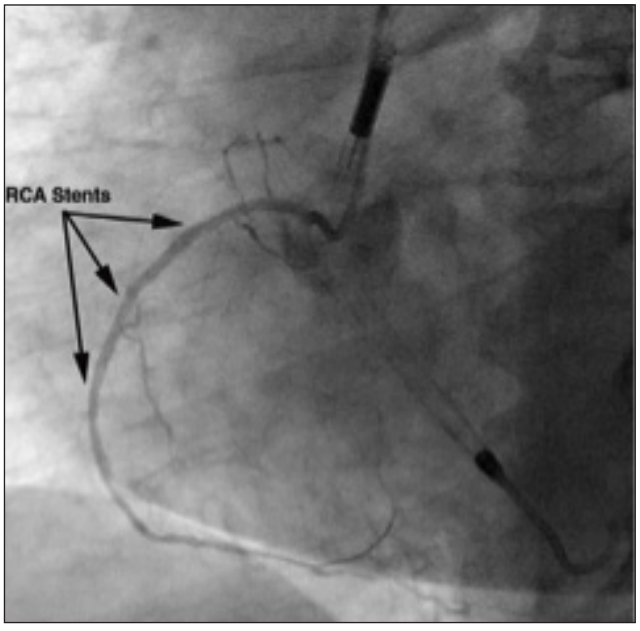

Figure 4. RCA after stent placement.

DISCUSSION

This patient with significant coronary artery disease and confounding cardiac dysfunction underwent a successful high-risk coronary intervention of the LAD coronary artery and RCA with placement of a DES at each lesion. The entire procedure was performed with the support of the Impella 2.5™ circulatory support system.

Maintenance of near-normal systemic blood pressure during three PCI procedures prevented hemodynamic compromise and was especially important during the 2-minute interval of cardiac arrest.

This case demonstrates the feasibility and ease of use of the Impella 2.5 device during high-risk, complex PCIs. The most striking aspect of this case was the support afforded the patient at the time of her heart block and resulting asystole. Despite the asystolic episode, she

Figure 5. The Impella 2.5™ catheter.

remained completely lucid and appeared to suffer no deleterious effects from this event.

While supported by the Impella 2.5, the patient remained stable and never exhibited any sign of distress. On restoration of cardiac rhythm, the revascularization procedures were completed with excellent angiographic and physiologic outcomes. Without the vital support provided by the Impella 2.5 device, the procedural outcome might have been appreciably worse.

DEVICE DESCRIPTION

The Impella 2.5™ microaxial blood pump is percutaneously placed in the left ventricle to provide up to 2.5 L/min of nonpulsatile blood flow into the aorta. The pump is inserted through a 13-F sheath placed in the femoral artery, and the 9-F catheter body is passed across the aortic valve to position the inflow port in the left ventricle, with the outflow port and axial flow pump in the ascending aorta (Figure 5). ■

Mark A. Grise, MD, is with Ochsner Heart and Vascular Institute in New Orleans, Louisiana.

Tyrone J. Collins, MD, is with Ochsner Heart and Vascular Institute in New Orleans, Louisiana.

Samir N. Patel, MD, is with Ochsner Heart and Vascular Institute in New Orleans, Louisiana.