

Impella 2.5™ Support During Left Main Coronary Artery Stenting and Transcatheter Occlusion of a Left Internal Mammary Artery Bypass Graft in a Patient With Severe Congestive Heart Failure

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KEY CLINICAL ISSUES

- Successful use of hemodynamic support in a challenging case involving a patient with comorbidities of CHF, renal insufficiency, and critical stenoses of the LMCA and LAD
- PCI reinfusion where a LIMA graft had inadvertently been placed on the great cardiac vein in a previous surgery

A 64-year-old man was admitted with unstable angina and severe congestive heart failure (CHF) 3 months after an apparently uncomplicated coronary artery bypass graft (CABG) revascularization.

The CABG procedure was nonemergent after angiographic evaluation and identification of a 90% ostial stenosis of the left main coronary artery (LMCA) and significant stenotic disease (90%) proximal to the first diagonal branch of the left anterior descending coronary artery (LAD). The patient had a nondominant right coronary artery (RCA), with the posterior descending coronary artery (PDA) originating from the circumflex coronary artery (Cx). During the previous CABG procedure, the left internal mammary artery (LIMA) graft was believed to have been placed to the LAD, one reversed saphenous vein graft (SVG) was placed to the obtuse marginal (OM) branch of the Cx, and a second SVG was placed to the left PDA. Transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE) at readmission revealed depressed left and right ventricular systolic function and right ventricular dilatation compared to the

results of TTE and TEE performed prior to CABG.

Coronary angiography (Figure 1) determined that the LIMA graft had inadvertently been placed on the great cardiac vein, resulting in a left-to-right shunt and biventricular high output failure/CHF. The LAD was devoid of coronary flow, the SVG to the left PDA was occluded, and the SVG to the OM was widely patent.

Renal insufficiency and CHF were considered high-risk factors for complications during a repeat CABG, therefore a percutaneous coronary intervention (PCI) was deemed most appropriate.

PROCEDURE DESCRIPTION

Temporary left ventricular support with the Impella 2.5™ cardiac assist system (Abiomed, Inc.) was

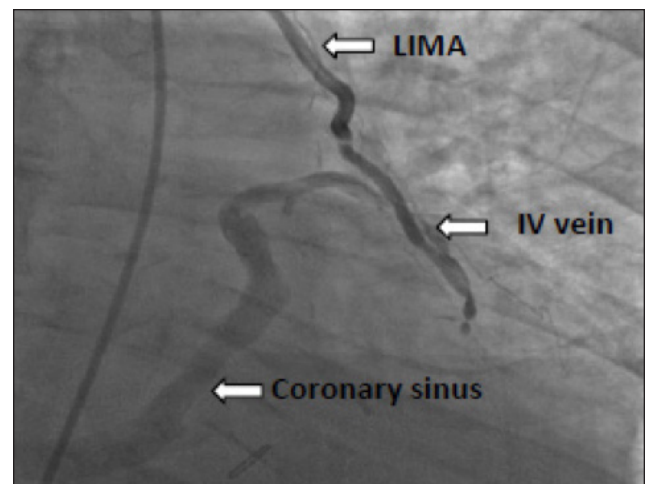


Figure 1. Angiogram of the LIMA graft to the great interventricular vein with drainage into the coronary sinus.

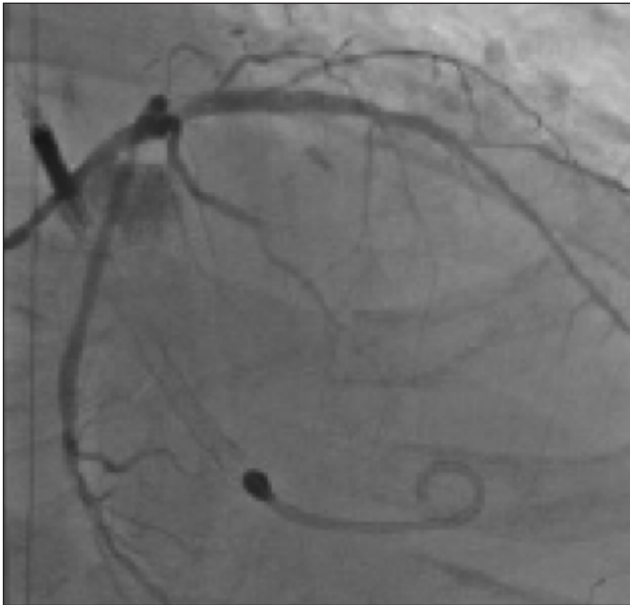


Figure 2. Excellent angiographic result after drug-eluting stent deployment.

indicated due to the CHF combined with the intention to perform unprotected LMCA stenting and transcatheter occlusion of the LIMA to the cardiac vein.

The Impella 2.5 catheter was positioned in the left ventricle and actuated to provide antegrade flow throughout the various phases of the PCI and transcatheter embolization procedure. The mid and proximal LAD and the LMCA were sequentially stented with drug-eluting stents, with an excellent angiographic result (Figure 2). A 6-mm Amplatzer™ Vascular Plug II (St. Jude Medical, Inc.) was deployed in the distal LIMA. Antegrade flow was significantly less, and the procedure was ended assuming thrombosis of the vascular plug would result in total occlusion of the LIMA (Figure 3).

PATIENT FOLLOW-UP

The Impella 2.5™ catheter was removed without complication, and the femoral access site was closed. The patient was discharged the next day.

Repeat angiography performed 1 week later showed persistent antegrade LIMA flow. Biventricular function had improved significantly with left ventricular EF estimated at 70%. A second embolization procedure was indicated, however, cardiac support for the second procedure was not warranted based on the satisfactory hemodynamic status of the patient. The Proxis™ embolic protection system catheter (St. Jude Medical, Inc.) was used to occlude the LIMA graft, while a second 4-mm Amplatzer Vascular Plug II was deployed proximal to the previously placed 6-mm plug. Antegrade flow into

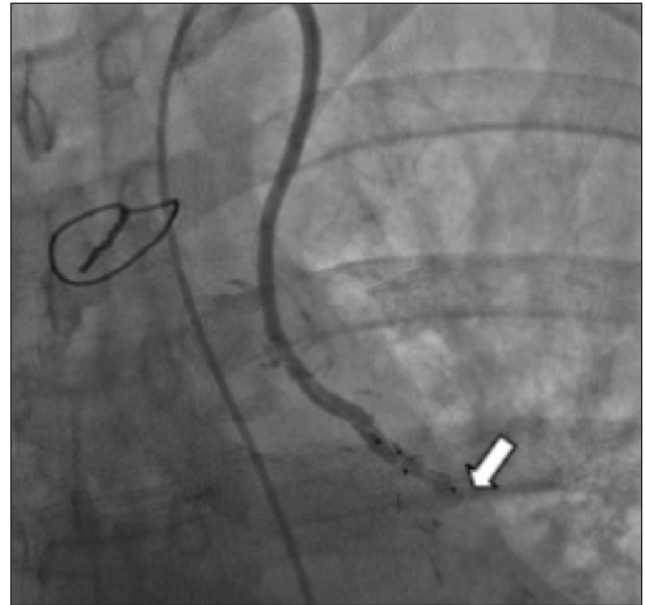


Figure 3. Final angiogram with no residual antegrade flow into the coronary sinus.

the coronary sinus was minimal. The patient had an uneventful recovery with subsequent complete resolution of CHF symptoms and return of normal renal function.

DISCUSSION

This unusual and exceptionally challenging case illustrates the use of the Impella 2.5™ cardiac assist system to provide critical left ventricular support during a high-risk PCI in a patient with comorbidities of CHF, renal insufficiency, and critical stenoses of the LMCA and LAD.

The Impella 2.5 device maintained a mean arterial blood pressure of 80 to 90 mm Hg throughout the 1-hour PCI procedure that included unprotected LMCA stenting, LAD stenting, and transcatheter occlusion of the LIMA graft. Cardiac output was augmented by 2 to 2.25 L/min during the interval of Impella support and the procedure was completed without complication.



Figure 4. The Impella 2.5™ catheter.

DEVICE DESCRIPTION

The Impella 2.5™ microaxial blood pump is percutaneously placed in the left ventricle to provide up to 2.5 liters per minute 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 4). ■

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