Introduction

Robotic percutaneous coronary intervention (PCI) offers the benefits of precision, control, and safety. The specific advantages of reduced radiation exposure and improved ergonomics for the operator are particularly impactful during long, difficult cases. This case study exemplifies the capabilities and success of robotic PCI in the treatment of complex lesions.

Case History

A 54-year-old man with a history of tobacco use and a family history of premature coronary atherosclerosis was admitted to the hospital with prolonged chest pain and dyspnea. He was diagnosed with a non-ST elevation myocardial infarction.

He was treated with aspirin, a beta blocker, a statin, intravenous (IV) unfractionated heparin (UFH), and nitroglycerin. An echocardiogram showed normal left ventricular function and wall motion with ejection fraction 55-60%.

Cardiac Catheterization Procedure

Cardiac catheterization was performed using right radial arterial access via 6 French (Fr) hydrophilic Glidesheath (Terumo). Coronary arteriography revealed a 95% stenosis in the proximal left anterior descending (LAD) artery with a rise to a medium-sized diagonal branch with a 75% ostial lesion (Figure 1). The decision was made to perform provisional bifurcation stenting.

Interventional Procedure

The CorPath Vascular Robotic System (Corindus Vascular Robotics) was utilized for percutaneous coronary intervention. Robotic PCI has been described in detail elsewhere. Briefly, the CorPath system consists of a bedrail-mounted robotic drive and sterile cassette. The cassette can be loaded with commercially available 0.014-inch guidewires and rapid exchange angioplasty and stent delivery systems. The cassette manipulates the guidewires and angioplasty devices using motorized rollers that provide axial and rotational forces. The robotic drive is connected to the control console via a communication cable. Operators perform PCI seated in a radiation-shielded interventional cockpit in the catheterization laboratory. Guidewires and catheters are manipulated using...
joysticks and a touch screen to control the movements of intravascular devices. Fluoroscopy, electrocardiography, and hemodynamics are “slaved” to monitors within the interventional cockpit for enhanced viewing.

The patient was consciously sedated and anticoagulation was achieved using additional IV UFH with an activated clotting time of 250-300 seconds.

The left main was engaged with a Runway 6 Fr Left BU4 guide catheter with side holes (Boston Scientific). A 0.014-inch Runthrough guidewire (Terumo) was loaded into the CorPath cassette by the scrub tech. The operator moved to the robotic interventional cockpit. Using the joystick on the control console, the operator advanced the wire across the severe stenosis in the LAD. The wire was then placed
in the cassette parking track. A 0.014-inch BMW guidewire (Abbott Vascular) was loaded into the CorPath cassette drive unit and robotically crossed the diagonal branch stenosis.

Dilatation of the ostium of the diagonal branch was performed with a 2.5 mm x 12 mm Trek balloon (Abbott Vascular) placed robotically over the BMW guidewire (Figure 2). The guidewire was then pulled back into the guide catheter. A 3.25 mm x 18 mm Xience Alpine drug-eluting stent (Abbott Vascular) was then placed robotically over the Runthrough guidewire dilating the LAD (Figure 3). This resulted in plaque shift into the ostium of the diagonal branch (Figure 4). The Runthrough guidewire was then robotically partially retracted, and then advanced through a proximal stent strut to rewire the diagonal branch ostium. A 2.5 x 12 mm Sprinter balloon (Medtronic) was driven robotically over the Runthrough guidewire through the proximal stent strut to dilate the diagonal branch ostium (Figure 5). Final angiography demonstrated negligible residual stenosis within the stented LAD and the angioplastied diagonal (Figure 6). No dissection was visualized and TIMI 3 flow was maintained. The patient tolerated the procedure well and was discharged to home the following day.

Discussion

Robotic PCI has emerged as a modality to assist in treating coronary lesions, offering reduced radiation exposure, and improved ergonomics for the operator. Precise controlled movements of coronary guidewires, balloons and stents are important in ensuring the patient gets the right stent in the right place. Proficiency in the use of robotic PCI leads to its routine use in complex situations including ostial or bifurcation lesions, in-stent restenosis, tortuous vessels, and long lesions as well as vein grafts and through internal mammary grafts. Routine application of the CorPath Vascular Robotic System can be integrated into the interventional catheterization lab and with proper training and experience, the interventionalist can add this new innovation to standard PCI care adopting a “robotics-first” approach.

The case described above shows the successful utilization of the CorPath Vascular Robotic System for bifurcation lesions. It demonstrates the capabilities of the technology including double wire intervention and the ability to recross through a stent strut for branch vessel ostium dilatation. More experience with this technology will potentially add to its utilization in more complex lesions.

References
