Left Pulmonary Stenting With the Assistance of a Deflectable Guide Catheter

A deflectable guide catheter enables left pulmonary artery stenting in tortuous pulmonary artery anatomy.

BY DAVID J. MILLER, MD

Technical advances in catheter-based procedures have allowed for the treatment of increasingly complex lesions. For example, the American Heart Association estimated that 1,059,000 percutaneous coronary interventions were performed in the United States in 2007.[1] Despite the high number of procedures, successful interventions can be challenging due to the difficulty of commonly used guide catheters or sheaths to gain access to the target lesion because of the severity of disease or complexity of the vascular anatomy. In many of these cases, advancing the access system through the vasculature may lead to vessel wall trauma and increased procedural complications.

The Morph deflectable guide catheter (BioCardia, Inc.) is a steerable and deflectable-tip guide catheter with a slotted nitinol torque tube that increases the operator's control for optimal positioning, which may facilitate the advancement of interventional devices in tortuous anatomy. A few case reports have demonstrated the effectiveness of this device in challenging cases where the use of standard devices has failed.[2-6]

This article describes a case in which the Morph deflectable guide catheter was successfully used in the access and subsequent stenting of a tight left pulmonary artery (LPA) stenosis in a 23-month-old boy.

CASE PRESENTATION

A 23-month-old, 9.5-kg boy with a history of tetralogy of Fallot, right-sided aortic arch, and bilateral superior vena cavae had undergone transannular patch repair and surgical left pulmonary arterioplasty and was referred to our institution for treatment of severe recurrent LPA stenosis. Cardiac catheterization from a right femoral venous approach revealed marked dilation of the right ventricular outflow tract. The main and right pulmonary arteries were also moderately dilated, and the proximal LPA presented a stenosis measuring 4 mm (the distal LPA mea-

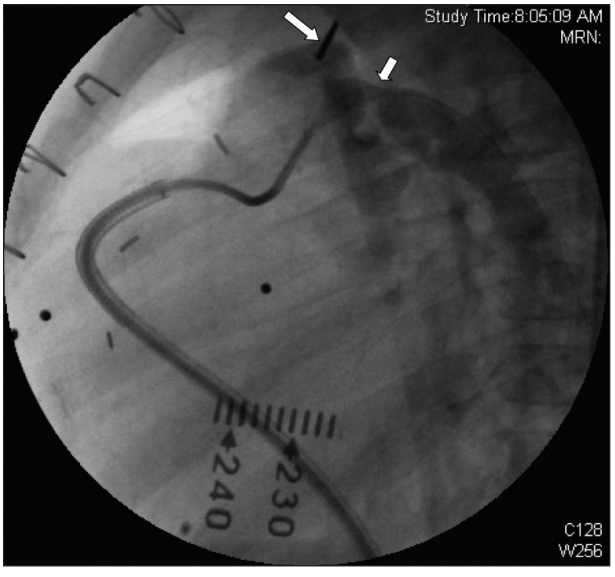

Figure 1. LPA stenosis (short arrow); ductal ampulla (long arrow) (lateral projection).

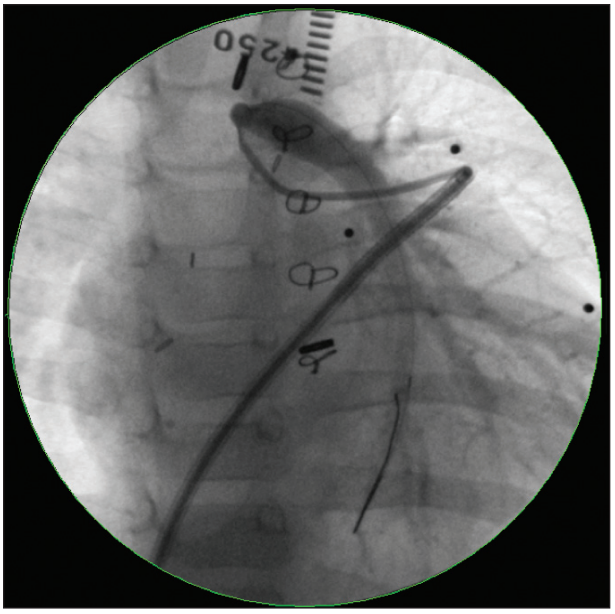

Figure 2. Nesting catheters (8-F Morph; 4-F, 0.038-inch lumen multipurpose; and 2.2-F microcatheter over a 0.014-inch guidewire). Note the tortuous catheter course through the right heart with the guidewire positioned into the lower LPA.

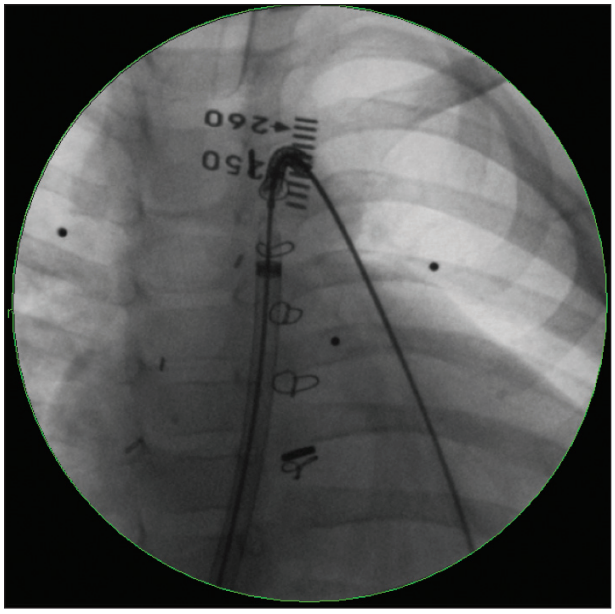

Figure 3. The Genesis stent mounted on a delivery balloon. Note how the catheter course has straightened out with the Amplatz Super Stiff guidewire in position.

sured 9.5 mm) (Figure 1). The pulmonary valve was mildly stenotic and moderately insufficient. The LPA takeoff was at an acute angle from the proximal right pulmonary artery, making access to the LPA challenging (Figure 2). Prestenting systolic pressures for the right ventricle, main pulmonary artery, right pulmonary artery (RPA), and LPA were 62, 46, 41, and 29 mm Hg, respectively.

Utilizing standard balloon-tipped and torqueable catheters and a variety of guidewires, access to the RPA was achieved; however, no catheter or wire could be advanced into the LPA. The LPA was finally accessed with the assistance of the deflectable guide catheter. The deflectable catheter was positioned just distal to the pulmonary valve, and a coaxial series of four separate catheters over a single wire (an 8-F Morph deflectable guide catheter over a 4-F multipurpose catheter over a 2-F Renegade microcatheter [Boston Scientific Corporation] over a 0.014-inch Grand Slam coronary wire [Abbott Vascular]) allowed the system to be positioned across the stenotic LPA origin. The outermost deflectable catheter was advanced up to the origin of the LPA, which allowed the microcatheter and coronary guidewire to be exchanged for a 0.035-inch, 1-cm floppy-tipped Amplatz Super Stiff guidewire (St. Jude Medical, Inc.), and a 10-F Torq Vue sheath and dilator (St. Jude Medical, Inc.) were then able to be positioned into the distal LPA over the Amplatz guidewire.

A Palmaz Genesis PG2910 stent (Cordis Corporation) was then delivered over a 14-mm X 3.5-cm BIB balloon (NuMed Corp.), resulting in an LPA minimum diameter of 10 mm with flaring on the proximal and distal ends of the stent (Figure 3). A pressure pullback from the LPA to the main pulmonary artery did not show a residual gradient. Poststenting systolic pressures for the right ventricle, main pulmonary artery, and LPA were 52, 37, and 37 mm Hg, respectively (Figure 4). The patient tolerated the procedure well despite blood loss during the multiple catheter and wire exchanges (hemoglobin value of 6.1 g/dL), which required a 10 mL/kg transfusion of packed red blood cells. Otherwise, the procedure was uneventful.

DISCUSSION

The main limitation of catheter-based interventions is, in some cases, the difficulty to gain access to the target lesion because of the severity of disease or anatomic complexity. This difficulty translates into less than optimal positioning of the therapeutic device, the inability to even be able to deliver the therapeutic device, and a greater potential for vascular injury and other procedural complications. Thus, new devices are needed to facilitate access in these challenging lesions.

In this case, the LPA could not be accessed with standard catheters because of the combination of a dilated right ventricular outflow tract and RPA in addition to an

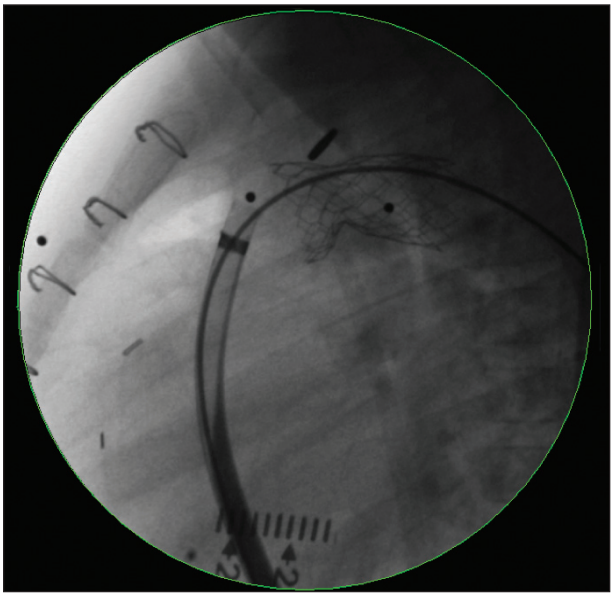

Figure 4. The LPA stent deployed. Note the residual constriction within the stent representing the site of maximal LPA stenosis (lateral projection).

acute takeoff of the LPA from the proximal RPA. To assist in accessing the target lesion and positioning the stent, an 8-F deflectable guide catheter with a 6.1-F inner diameter (working length, 90 cm) was used. The catheter proved to be very useful in allowing access to the LPA by way of the deflectable tip, leading to the ability to deploy the super-stiff guidewire into the distal LPA to facilitate placement of the 10-F Torq Vue sheath and dilator. Alternative approaches to limit the blood loss incurred during the procedure could include manually fashioning a valve for the TorqVue valveless sheath by cutting a short segment of a larger valved sheath with a hemostasis valve and inserting the sheath with hemostasis valve into distal end of the TorqVue sheath to achieve improved hemostasis. Alternatively, performing the procedure via a hybrid approach would have facilitated access to this patient's challenging anatomy, however, we elected to complete the procedure in the cath lab, accepting the degree of blood loss, which was significant but well tolerated by the patient.

CONCLUSION

The effectiveness of using the Morph deflectable guide catheter to access the target lesion and facilitate deployment of the stiff guidewire necessary to complete the stenting procedure was excellent, particularly because of the complex and unfavorable anatomy of the LPA. Pulmonary artery access using the Morph deflectable guide catheter saved significant procedural time by enabling quick access to the complicated anatomy after other access techniques had failed. The use of newer interventional devices, such as the Morph deflectable guide catheter, should translate into better outcomes for this subgroup of patients in that there is less manipulation in the body, the lesion can be accessed quickly, and the interventional devices are able to be delivered. ■

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