

Percutaneous Intervention With GuideLiner Catheter in 4 Patients With Anomalous Coronary Artery Originating From Opposite Sinus of Valsalva

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Percutaneous intervention in anomalous coronary arteries originating from the opposite sinus of Valsalva is complicated by their unusual location and course, which makes selective cannulation difficult. The GuideLiner (Vascular Solutions, Inc.) is a monorail guide extension catheter designed to advance beyond the tip of a mother guide catheter to enable deep intubation of a coronary artery, provide extra support, and improve coaxial alignment. We describe the cases of 4 patients with an anomalous coronary artery originating from the opposite sinus of Valsalva—including 2 with acute myocardial infarction—who underwent successful percutaneous coronary intervention with use of a GuideLiner catheter. (Tex Heart Inst J 2022;49(4):e207466)

Anomalous origin of a coronary artery from the opposite sinus of Valsalva (ACAOS) is a congenital malformation with an estimated incidence between 0.3% and 5%.^{1,2} Percutaneous coronary intervention (PCI) in anomalous coronary arteries may be necessary in patients who also present with acute coronary syndrome or in stable patients with a low-risk coronary anatomy. However, selective cannulation in ACAOS is complicated by the unusual origin and course of anomalous vessels. The GuideLiner (Vascular Solutions, Inc.) is a monorail guide extension catheter designed to advance beyond the tip of a mother guide catheter to enable deep intubation of coronary arteries, provide extra support, and improve coaxial alignment. We describe the cases of 4 patients with ACAOS who underwent successful PCI with use of a GuideLiner catheter.

Case Reports

Patient 1

A 52-year-old woman with no known cardiovascular risk factors presented with acute chest pain of one hour's duration. An electrocardiogram obtained at presentation showed ST-segment elevation in the inferior leads. An urgent coronary angiogram obtained through the right radial artery revealed a regular left coronary artery tree; however, the right coronary artery (RCA) could not be located despite the use of several different catheters (Judkins right 4.0, Amplatz right 2.0, and Judkins left 3.5). A subsequent aortogram revealed complete occlusion of an anomalous RCA originating from the left coronary sinus (R-ACAOS). Therefore, we decided to perform PCI. An Amplatz left 1.0 guide catheter was inserted and advanced to engage the RCA ostium,

followed by a Balance Middleweight wire; however, distal flow was not restored. An aspiration catheter was then advanced through the occluded segment with use of a GuideLiner catheter to provide backup support and selectively catheterize the vessel. Finally, 2 overlapping drug-eluting stents were deployed at the mid and proximal RCA, resulting in Thrombolysis In Myocardial Infarction (TIMI)-3 flow and relief of chest pain (Fig. 1). The total procedure time was 80 minutes. The patient was discharged from the hospital 3 days later with normal systolic left ventricular function, and she remained asymptomatic 1.5 years later.

Patient 2

A 68-year-old man with one kidney and effort angina presented for coronary angiography. Two weeks before

presentation, the patient had undergone stress magnetic resonance imaging (MRI) and multislice cardiac computed tomographic (CT) angiography. The stress MRI scan showed ischemia of the inferior wall, and the cardiac CT angiogram revealed R-ACAOS with a low interarterial course below the valve plane and severe stenosis at the mid RCA. Given the low risk of this subtype of R-ACAOS with a course below the pulmonary artery and aorta compression plane, we decided to perform PCI. A Judkins 3.5 left guide catheter was inserted through the right radial artery and advanced until it engaged the RCA. A GuideLiner catheter was deployed to selectively catheterize the artery. Finally, 2 overlapping stents were deployed at the proximal and mid RCA with good angiographic results (Fig. 2). The patient was discharged from the hospital one day after

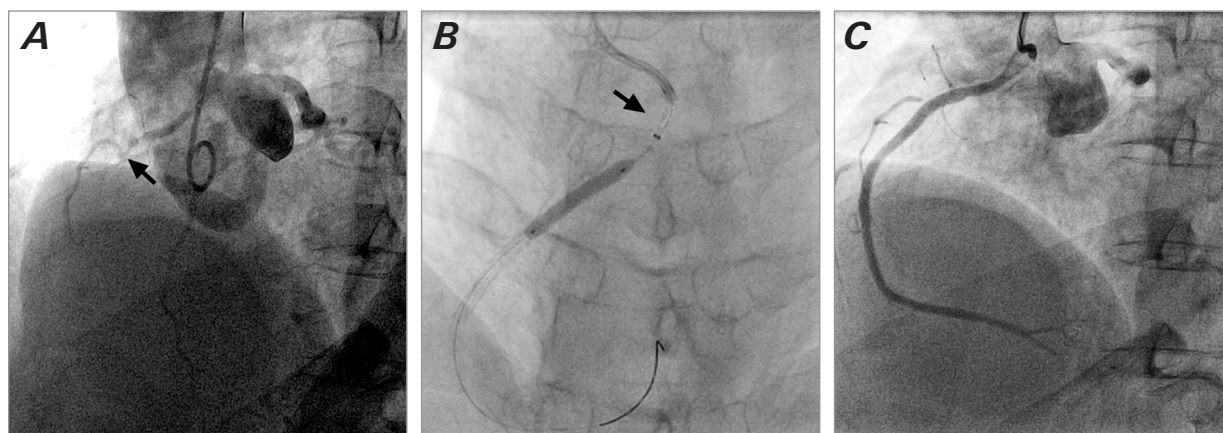


Fig. 1 Patient 1. **A**) Left anterior oblique aortogram of an anomalous right coronary artery (RCA) originating from the left coronary sinus in the presence of acute inferior myocardial infarction shows complete occlusion of the mid RCA (arrow). Coronary angiograms show **B**) the RCA after selective catheterization with use of a GuideLiner catheter (arrow) and implantation of 2 overlapping drug-eluting stents, and **C**) the final angiographic result.

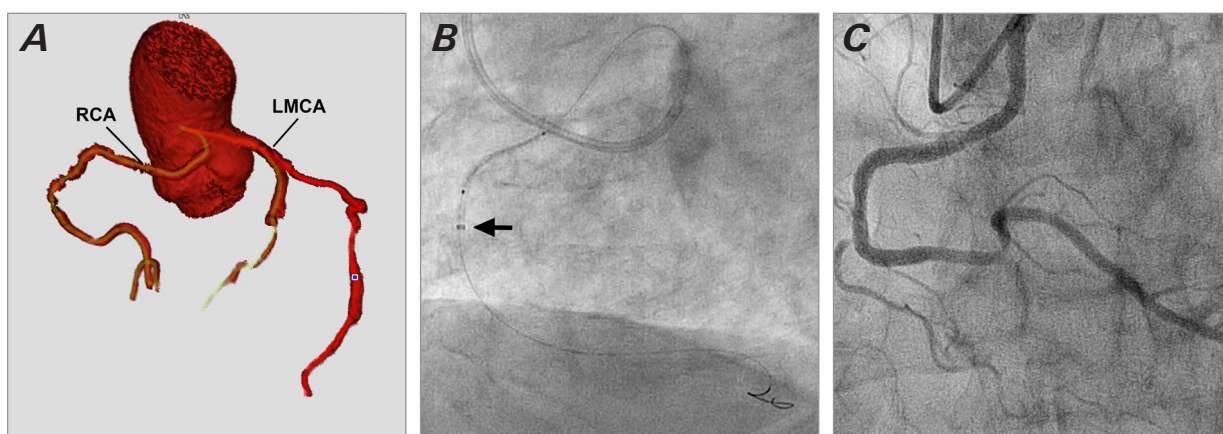


Fig. 2 Patient 2. **A**) Three-dimensional reconstruction shows an anomalous right coronary artery (RCA) originating from the left coronary sinus. Coronary angiograms show **B**) the RCA after selective catheterization with use of a GuideLiner catheter (arrow) and implantation of 2 overlapping stents at the proximal and mid RCA, and **C**) the final angiographic result.

LMCA = left main coronary artery

Supplemental motion image is available for [Figure 2B](#).

the stenting procedure and remained asymptomatic one year later.

Patient 3

A 71-year-old woman presented with syncope and complete atrioventricular block associated with acute inferior myocardial infarction (MI) of one hour's duration. A left coronary angiogram obtained through the right radial artery revealed extensive stenosis of the mid left anterior descending coronary artery (LAD) and collateral circulation to the distal RCA from septal branches. Several unsuccessful attempts were made to locate the RCA with use of 5F Judkins right, 6F Amplatz right, and 6F Amplatz left catheters; orthogonal aortography; and angiographic exploration of the 3 aortic sinuses through the femoral artery. We then decided to perform rescue PCI with use of a 3.5 extra backup guide catheter. First, we implanted 2 overlapping stents from the proximal to the mid LAD to improve retrograde flow to the inferior segments. Then, we advanced the extra backup guide catheter to the ostium of the RCA that originated from the left coronary sinus (R-ACAOS), near the left main coronary artery (LMCA). The proximal RCA was completely occluded (Fig. 3A), so we advanced a GuideLiner catheter over an anchoring balloon to selectively catheterize the artery and cross the lesion (Fig. 3B). Finally, we implanted a drug-eluting stent, which restored distal flow (Fig. 3C). The total procedure time was 100 minutes. Five days after PCI, the patient had recovered atrioventricular conduction and was discharged from the hospital. She remained asymptomatic one year later.

Patient 4

A 68-year-old man with a history of smoking and high blood pressure presented with progressive chest pain of

4 months' duration. Single-photon emission CT myocardial perfusion images obtained before presentation had shown severe ischemia in the anterior and inferior cardiac segments. At presentation, a 320-slice cardiac CT angiogram revealed anomalous origin of the LMCA from an ostium shared with the RCA at the right sinus of Valsalva, with an intraseptal course (L-ACAOS-IS) (Fig. 4A) below the pulmonary valve plane. The cardiac CT angiogram also revealed severe stenosis in the mid RCA and ostial LAD. A coronary angiogram obtained with use of a Judkins right catheter through the right femoral artery revealed severe stenosis of the posterior descending coronary artery and mid RCA and stenosis of the ostial LAD (Fig. 4B). We treated the stenosis in the mid RCA by implanting 2 drug-eluting stents. Then, with use of a GuideLiner catheter, we selectively catheterized the anomalous LMCA and deployed a drug-eluting stent in the stenotic ostial LAD (Fig. 4C), with good angiographic results (Fig. 4D). The total procedure time was 40 minutes. The patient was discharged from the hospital one day after the procedure and remained asymptomatic one year later.

Discussion

Percutaneous intervention in ACAOS is always challenging, especially when attempting to selectively catheterize an anomalous vessel. The GuideLiner extension catheter, widely used in complex PCIs,³ has rarely been used in treating ACAOS.⁴⁻⁸ The 5 previously reported cases of PCI in ACAOS—all involving R-ACAOS and all successful—included 4 patients with unstable angina^{4,5} or non-ST-segment-elevation MI,^{7,8} who needed urgent treatment, and one patient with chronic total occlusion of the R-ACAOS.⁶ In one of the patients with

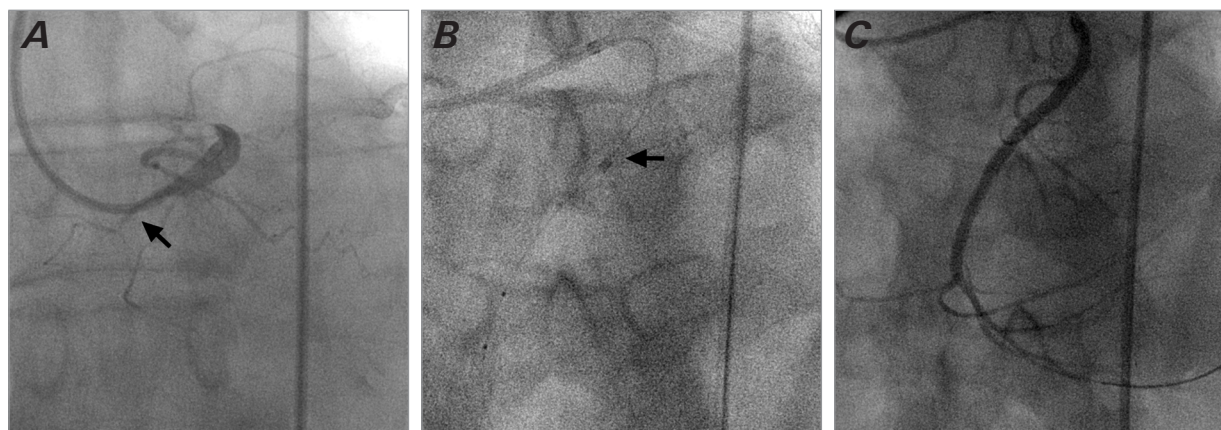


Fig. 3 Patient 3. **A**) Coronary angiogram of an anomalous right coronary artery (RCA) originating from the left coronary sinus in the presence of inferior acute myocardial infarction shows occlusion of the mid RCA (arrow) and selective catheterization with a 3.5 extra backup catheter. Subsequent coronary angiograms show **B**) the RCA after selective catheterization with use of a GuideLiner catheter (arrow) advanced over a coronary angioplasty balloon, and **C**) the final angiographic result including recovered distal flow.

Supplemental motion images are available for Figures 3A and 3B.

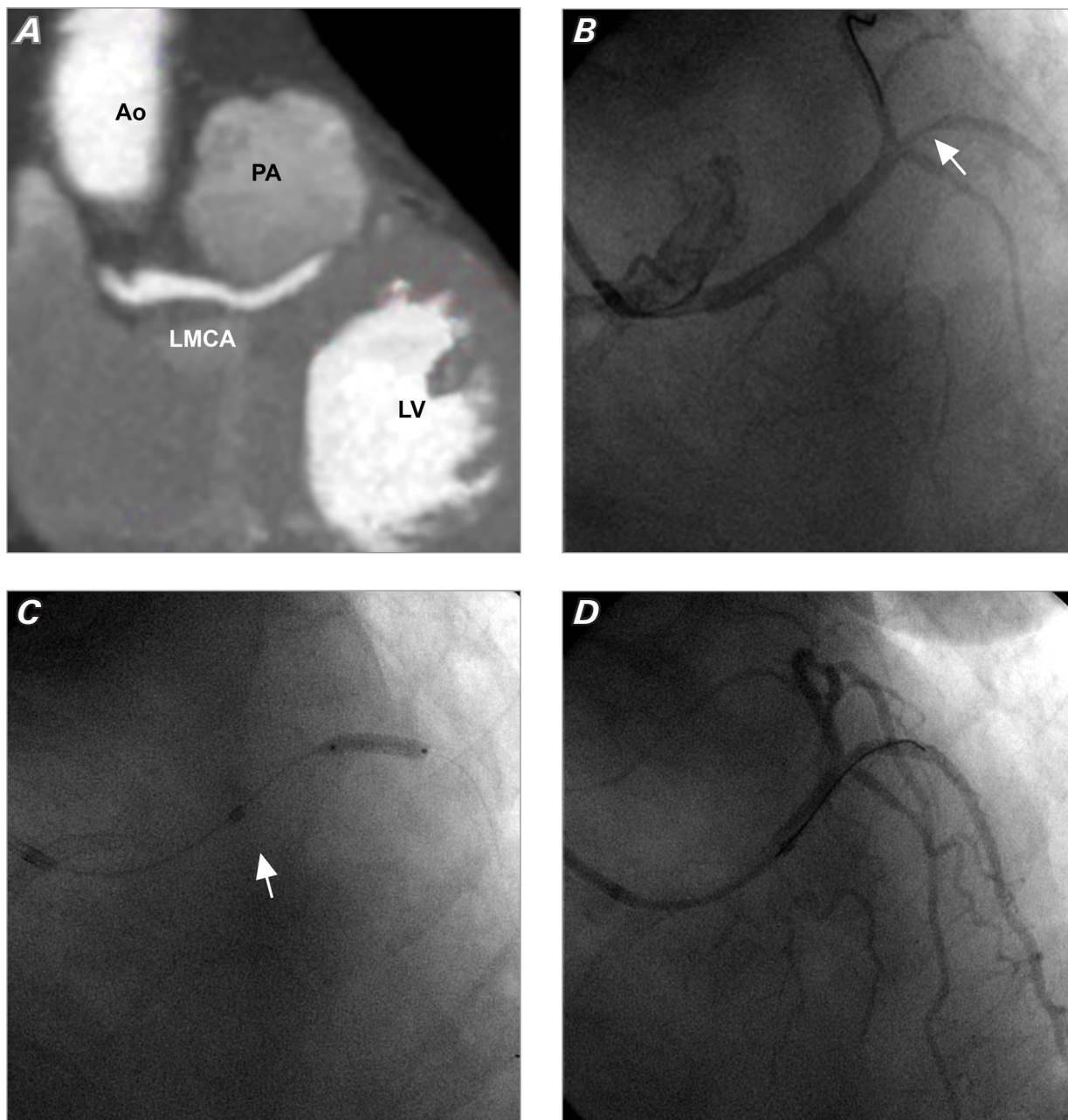


Fig. 4 Patient 4. **A)** A 320-slice cardiac computed tomographic angiogram (sagittal view) shows an anomalous left main coronary artery (LMCA) originating from the right coronary sinus, with an intraseptal path between the pulmonary artery (PA) and the left ventricle (LV). **B)** Coronary angiogram shows the anomalous LMCA and severe stenosis at the ostium of the left anterior descending coronary artery (LAD) (arrow). Subsequent coronary angiograms show **C)** a drug-eluting stent implanted with GuideLiner catheter support in the ostial LAD (arrow), and **D)** the final angiographic result.

Ao = aorta

non-ST-segment-elevation MI,⁸ the Guideliner caused anterograde dissection that necessitated placement of an additional stent.

In each of our 4 patients, the GuideLiner catheter easily entered the anomalous vessel. In patients with a severely torturous artery, advancing the GuideLiner catheter over an inflated anchoring balloon (as in Patient 3) and manually injecting the contrast medium through

the catheter is advisable. In patients with ACAOS-IM, temporary dilation of the anomalous artery by the catheter may make it difficult to determine whether the intramural course within the aortic wall is compressing the anomalous artery and whether there is any ostial congenital stenosis. Some authors have reported using customized guide catheters to selectively catheterize R-ACAOS and provide extra support.^{9,10}

Although ACAOS is usually benign and unrelated to ischemia, ACAOS with a high interarterial course may increase the risk of sudden cardiac death related to compression of the aberrant vessel between the pulmonary artery and the aorta.^{11,12} Consequently, in patients presenting in stable condition, an exhaustive anatomic study to define the path of the anomalous vessel and design a better treatment plan is strongly recommended.

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