

# Successful Percutaneous Coronary Intervention With Stent Implantation in Anomalous Right Coronary Arteries Arising From the Left Sinus of Valsalva: A Report of Two Cases

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Percutaneous coronary intervention (PCI) in an anomalous right coronary artery arising from the left sinus of valsalva can be technically challenging because of difficulty in selectively cannulating the vessel. We present two cases of successful stent implantation in an anomalous right coronary artery arising from the left sinus of valsalva. In both cases, we used an oversized 6 Fr Judkins left guiding catheter, which provided excellent angiographic visualization and guide support for stent delivery. *Cathet Cardiovasc Intervent* 2002;55:105–108. © 2002 Wiley-Liss, Inc.

**Key words:** coronary anomalies; angiography; angioplasty

## INTRODUCTION

Coronary anomalies are found in 0.2%–1.2% of the population and represent marked deviation of the normal anatomical pattern [1]. An anomalous origin of the right coronary artery (RCA) from the left sinus of valsalva is a rare congenital abnormality, representing 8%–16% of all coronary anomalies. The anomalous RCA usually originates from an orifice located anterior to the left main coronary ostium and courses between the aorta and the pulmonary artery [2].

The degree to which risk of sudden death is associated with the anomalous origin of an RCA from the left sinus of valsalva remains controversial. This anomaly has been found in some necropsy studies of young individuals with sudden, unexplained death [3]. However, it does not appear to be associated with the same level of risk as that found with an anomalous left coronary artery arising from the right sinus of valsalva traveling between the great vessels. In fact, it is not rare to see individuals in late adulthood present with an anomalous RCA from the left sinus of valsalva with coexistent atherosclerotic disease. Because of the unusual location and the noncircular coronary orifice of this anomaly, selective catheterization and percutaneous intervention of an anomalous RCA can be technically challenging, particularly with regard to adequate guide catheter support. We report two cases in which we used a similar technique for stent implantation in an anomalous RCA. We have included a discussion of the technique, as well as a review of similar cases.

## CASE REPORTS

### Case 1

A 67-year-old woman with a history of diabetes and tobacco abuse presented to the emergency department with substernal chest pain and associated ST-segment elevation in the inferior leads. She was immediately treated with tissue plasminogen activator (tPA) and clinically reperfused. Four days later, an elective cardiac catheterization was performed, with access through the left femoral artery. The left coronary artery was cannulated with a 6 Fr Judkins left 3.5 cm curve catheter, revealing insignificant disease. Selective cannulation of the RCA could not be achieved with either a Judkins right 3.5 or 4.0 cm curve diagnostic catheter. Nonselective injection of the ascending aorta revealed an aberrant origin of the RCA from the left sinus of valsalva near the origin of the left main coronary artery. A Judkins left 4.0 cm curve catheter was then used to engage the aberrant RCA selectively without difficulty and revealed a 95% lesion in the mid-portion of the right coronary artery (Fig. 1). Subsequently, percutaneous coronary interven-

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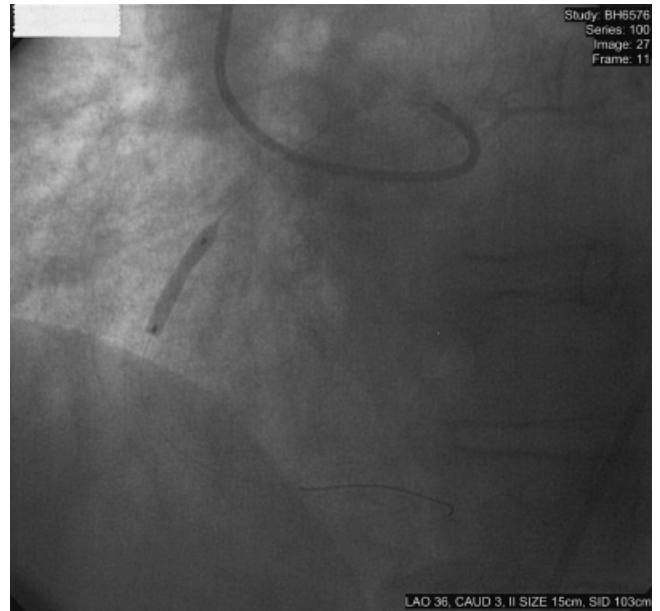


**Fig. 1.** Cannulation of the anomalous RCA with a 6 Fr Judkins 4.0 cm left diagnostic catheter (a Judkins left 3.5 cm catheter was used to engage the left main coronary artery). A 95% occlusion is revealed in the mid-portion of the vessel. The takeoff of the left main from its normal position in the left coronary cusp can be seen.

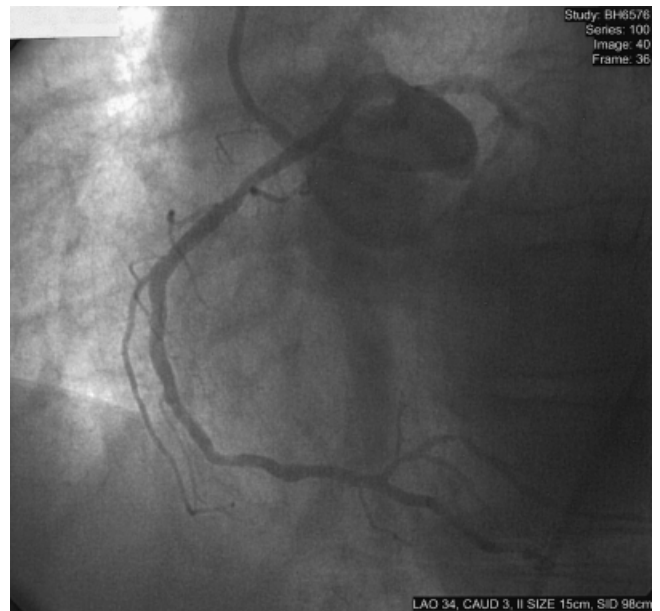
tion (PCI) was performed with use of a 6 Fr Judkins left 4.0 cm guiding catheter (Fig. 2), which provided excellent support. The lesion was crossed with a Traverse guidewire (Guidant, Advanced Cardiovascular Systems, Santa Clara, CA) predilated with a 3.0–20 mm Ranger over-the-wire balloon catheter (SciMed, Boston Scientific, Maple Grove, MN). Stent placement was accomplished with a 3.0–18 mm Crossflex LC coronary stent (Cordis, Johnson and Johnson Interventional Systems, Warren, NJ) delivered at 14 atm. The result was a final stenosis of less than 5% (Fig. 3). Abciximab was administered in the catheterization laboratory. Other adjunctive medical treatment included a daily regimen aspirin 325 mg and clopidogrel 75 mg every 24 hr. Postprocedural cardiac enzymes revealed no evidence of myocardial damage. The patient had an uneventful hospital course and was discharged the following day.

**Case 2**

A 47-year-old man with a history of hypertension, remote tobacco abuse, and hyperlipidemia presented 5 years after undergoing successful balloon angioplasty of the left circumflex artery. The patient had experienced a recurrence of symptoms and thus was scheduled for elective cardiac catheterization, which revealed insignificant disease in the left coronary system. During the



**Fig. 2.** Engagement of the anomalous RCA with a 6 Fr Judkins left guiding catheter, which provides excellent support for balloon and stent delivery.



**Fig. 3.** Final result after stent delivery, resulting in < 5% residual stenosis. Again, the takeoff of the left main coronary artery is visualized, arising from its anatomic position in the left coronary cusp.

diagnostic procedure, the RCA could not be selectively cannulated with a Judkins right 3.5 cm, Judkins right 4.0 cm, or an Amplatz left 2 catheter. Nonselective injection in the aortic root revealed an anomalous origin of the RCA from the left sinus of valsalva, with a 95% occlu-

sion in the proximal portion of the artery. The patient was returned to the cardiac catheterization laboratory on the following day. PCI was performed, with vascular access through the right femoral artery. The anomalous right coronary artery was selectively cannulated with a 6 Fr Judkins left 5.0 guiding catheter. The occlusion was crossed with a Traverse guidewire (Guidant) predilated with a 3.0–15 mm Quantum Ranger over-the-wire balloon catheter (SciMed). Stent placement was accomplished with a 3.0–23 mm Crossflex LC stent (Cordis). The residual stenosis was less than 5%. Pharmacologic support in the catheterization laboratory included abciximab and a loading dose of clopidogrel (300 mg). The patient had an uneventful postprocedural recovery and was discharged home the next day on a daily regimen of aspirin (325 mg) and clopidogrel (75 mg).

## DISCUSSION

We report two cases of PCI with stent implantation in an anomalous RCA originating from the left sinus of valsalva. Both cases were performed with a similar technique, which utilized a 6 Fr Judkins left guiding catheter with a larger secondary curve than the one used to cannulate the left coronary artery ostium. The Judkins left catheter was pushed deep into the left sinus of valsalva, causing it to make an anterior and cephalad-pointing U-turn. The larger curve prevented the catheter from automatically engaging the left coronary artery and allowed for selective cannulation of the anomalous RCA without difficulty. Importantly, this technique provided excellent backup support for delivery of the angioplasty balloon and stent.

Whereas the overall percentage of anomalous coronary arteries is relatively low, a busy interventionalist will likely encounter some unusual cases such as those reported here. The selective cannulation of aberrant arteries can be difficult and time-consuming. Knowledge of the variations in coronary artery origin can help in selecting the appropriate catheters for diagnostic and therapeutic interventions [4]. Specifically, anomalous origin of the RCA from the left sinus of valsalva has been noted in 0.02%–0.17% of coronary arteriograms [5]. The artery most commonly lies anterior and cephalad to the left main coronary artery. It typically takes an abrupt caudal and rightward course anterior to the aorta, between the great vessels, prior to continuing on into the right-sided atrioventricular groove.

If anomalous origin of the RCA from the left sinus of valsalva is found in a young individual with exertional chest pain or syncope, or provokable inferior ischemia, surgical correction of this anomaly must be strongly considered. When this anomaly is encountered in an adult with coexistent atherosclerotic coronary disease,

percutaneous intervention may present a challenge. The anterior location of the ostium in the left sinus, the tortuous proximal portion, and the initial anterior-caudal and rightward course all present challenges for coronary cannulation and, more importantly, backup support during PCI.

There are a small number of single-case reports of coronary interventions in anomalous right coronary arteries originating from the left sinus of valsalva [6–13]. Most of these reports describe the experience with balloon angioplasty alone using 8 Fr guiding catheters of different configurations. The Amplatz AL-1 guiding catheter has been successfully used in three cases [6–8]. In two of these cases, a balloon-on-a-wire system had to be used to treat the target lesion because of poor guide catheter support. In another case reported by Oral et al. [9], stable support could not be accomplished with the use of an Amplatz AL-2 guiding catheter, and they were unable to advance a balloon catheter into the anomalous coronary artery. Others have used guiding catheters with shapes similar to the Judkins left catheter, but with small secondary curves (3.5 and 4) [10–12].

In accordance with our experience, Lorin et al. [13] recently published two cases of stenting in an anomalous RCA by use of a 6 Fr Judkins left 5.0 cm guiding catheter. But unlike our experience, these authors used right radial access after being unable to cannulate the anomalous RCA through the femoral artery. Ours is the only reported experience in which this technique for stent placement has been applied by use of a femoral approach.

Successful PCI of anomalous coronary arteries relies on optimal guiding catheter seating and backup support. Whereas each individual case may require a slightly different approach, we believe that, for the majority of cases, the method described here for cannulation of an aberrant RCA arising from the left sinus of valsalva will increase the likelihood of technical success. The 6 Fr catheter is less rigid than 8 Fr guiding systems and allows for greater manipulation of the guiding catheter. The preformed shape of the Judkins left catheter is designed to engage an ostium in the left sinus. By employing an oversized catheter, that is, one with a larger secondary curve relative to that required to cannulate the ostium of the left coronary artery, predictable cannulation of the anomalous RCA in a coaxial fashion can be accomplished. This results in excellent angiographic visualization and support for coronary angioplasty and stenting.

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