

# Successful Primary PCI in a Patient With Single Coronary Artery

Krzysztof Pawlowski, MD, Waldemar Dorniak, MD, Jacek Klaudel, MD

**ABSTRACT:** Sudden occlusion of the only patent coronary artery is usually a devastating event. We describe the case of a successful percutaneous recanalization of a single coronary artery originating at the right sinus of Valsalva.

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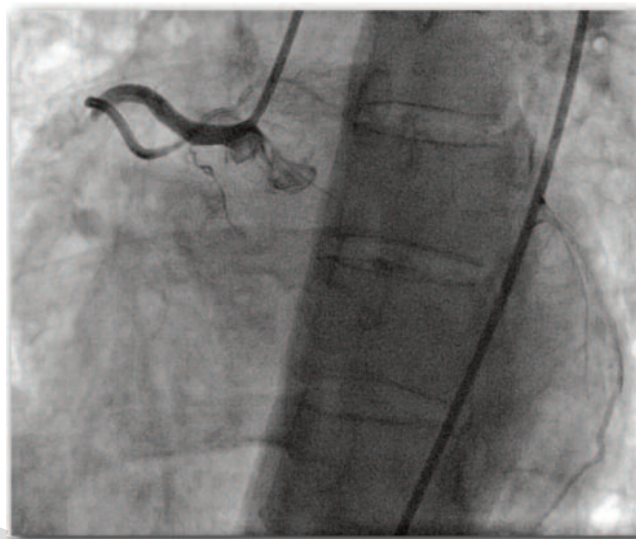
**Key words:** single coronary artery, occlusion

**Case Report.** The patient was a 54 year-old female admitted to our hospital with typical 3-hour resting angina and vegetative symptoms with excessive sweating. She had a history of hypertension, hyperthyroidism, hysterectomy, and nicotineism. At the time, she had been treated with beta-blocker, ACE inhibitor and HRT (estradiolum plus norethisteroni acetat). The patient had reported no exercise angina when hospitalized due to severe hypertension a few years before. Electrocardiographic (ECG) examination showed sinus rhythm with ST-segment elevation in inferior wall leads with reciprocal ST-segment depression in leads I, aVL, and V1-V4. Vascular access was obtained by right femoral artery. Coronary angiography revealed proximal occlusion of dominant right coronary artery (RCA) with thrombus just 2 mm below the take-off of the conus arteriosus branch — the only patent collateral to the left coronary system (Figure 1).

The ostium of the left main (LM) was absent on both attempted selective left coronary artery (LCA) angiograms and following aortography. RCA recanalization was performed using a JR 3.5 6 Fr guiding catheter. A Runthrough Hypercoat guidewire (Terumo) was passed through the occlusion up to the distal part of the RCA without difficulty. Successful thrombectomy (Figure 2) was performed with an Eliminate aspiration catheter (Terumo).

A significant lesion in the proximal segment of the RCA was stented with a 4.0 x 28 mm Promus Element drug-eluting stent at 10 atm. Stenting effect was optimized with a 4.5 x 12 mm Quantum Maverick (Boston Scientific) at 12 atm achieved very good angiographic result (Figure 3). Low-pressure stent implantation followed by high-pressure NC balloon postdilatation is our policy to avoid edge dissection.

Intracoronary bolus of IIB/IIIa eptifibatide was given and fol-



**Figure 1.** Coronary angiogram of acutely occluded single coronary.

lowed by intravenous infusion. Surprisingly, the patient's hemodynamics were only slightly compromised — she presented with pulmonary congestion (but not pulmonary edema), arterial blood pressure remained normal throughout the angioplasty, and no cardiac support was required (Figures 4, 5, and 6).

After the procedure was completed, the patient developed transient proximal second-degree atrial-ventricular block that required no action. Accompanying urinary infection was successfully treated with antibiotics. Further cardiac rehabilitation was uneventful. ECG showed typical evolution of inferior wall myocardial infarction. After 40 days, she was readmitted to our hospital for repeat angiography. Good short-term angiographic result of angioplasty was confirmed.

On the control angiography, it was apparent that the patient had single coronary vessel that originated in the right sinus of Valsalva. The LM ostium was absent. The single artery showed a typical course of a dominant RCA and created branches to the circumflex artery (LCX) and the left anterior descending (LAD) branch. The secondary vessels clearly branched toward the base of the heart and they showed no significant arteriosclerotic lesions. Echocardiography found no concomitant structural heart anomalies. After 9 months, the patient remained asymptomatic and the early submaximal exercise ECG test was negative. Magnetic resonance imaging (MRI) confirmed both absence of LM and presence of single coronary artery (SCA) originating from the right sinus of Valsalva (Figure 7).

From the Cardiology Department, Sw. Wojciecha Hospital, Gdansk, Poland.

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Address for correspondence: Krzysztof Pawlowski, MD, Szpital Sw. Wojciecha, Cardiology Department, Al. Jana Pawla II 50, 80-462 Gdansk, Poland. Email: krzysztof.pawlowski@wp.pl

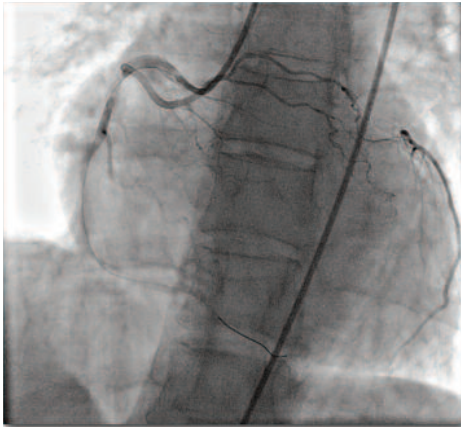


Figure 2. Single coronary artery after thrombectomy.

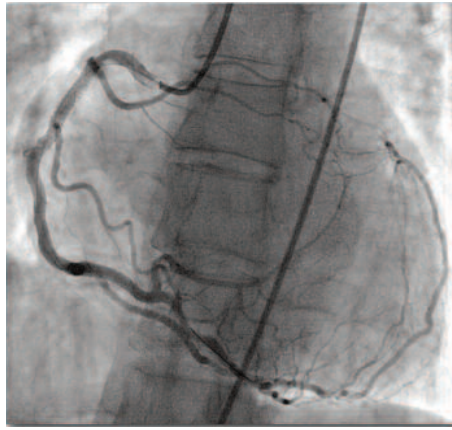


Figure 3. Result of primary angioplasty.

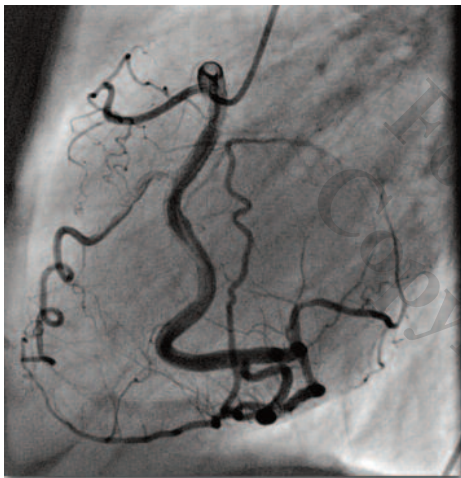


Figure 4. Follow-up coronary angiography.

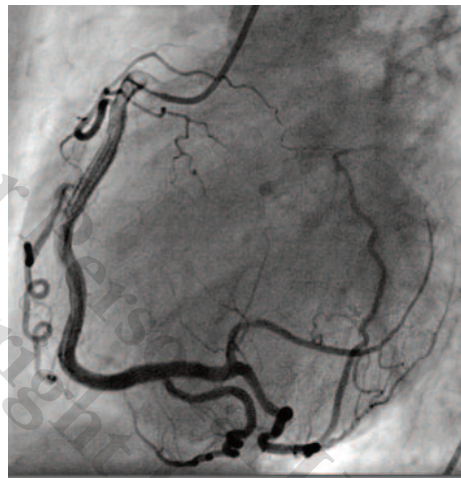


Figure 5. Another view of single coronary artery.

often have normal distribution and are supplied with blood from the RCA by multiple collaterals. LM agenesis is an extremely rare entity and may be found in 0.0024%-0.044% of the population.<sup>6</sup> SCA with agenesis of aorto-coronary ostium of either RCA or LM has been described, but is very rare.<sup>4,5,12</sup> In such cases, arteries create a single system where vessel continuity and integrity are intact (Figure 7).

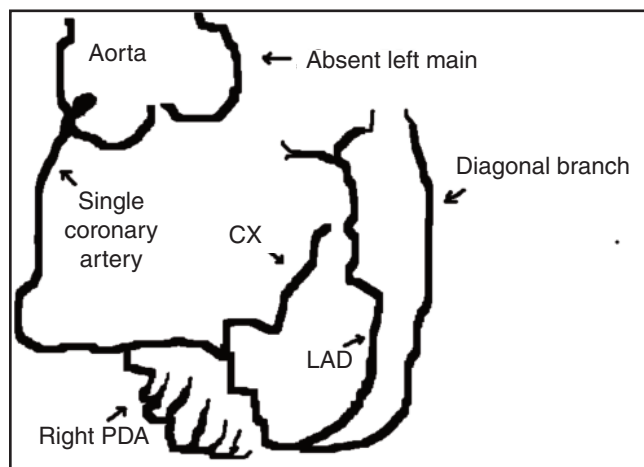
The recent advances in imaging modalities such as multidetector computed tomography and MRI and their better availability may improve our knowledge of these rare conditions, their frequency, and prognosis.<sup>1,15</sup>

Our case may be classified as an SCA. It is type IIA of single coronary ostium according to a recent classification by Shirani and Roberts. There are approximately 20 subtypes of SCA. It is a very rare condition, with an incidence of 0.03%. Type IIA differs significantly from other variations, since there is a single coronary trunk and it does not immediately divide into left and right system. This is a “true” SCA that gives away its branches on its way toward the base

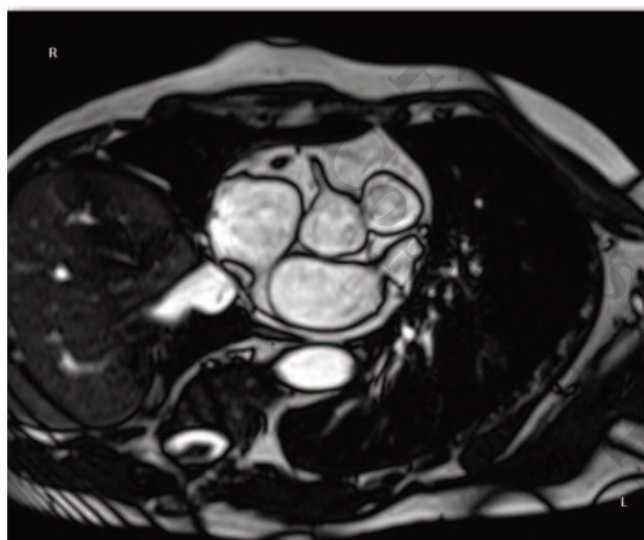
**Discussion.** Congenital coronary vessel anomalies are rare but important causes of cardiac morbidity and mortality. They usually present in childhood as sudden cardiac death, myocardial infarction, congestive heart failure, and syncope or chest discomfort. At the same time, congenital anomalies of coronary arteries may be present in 0.5%-1% of the asymptomatic population.<sup>1</sup> They are classified as anomalies of origin, course, or termination. Anomalies of origin are classified as high take-off, multiple ostia, SCA, and anomalous origin. Anomalies of course comprise duplication of arteries and myocardial bridging, while anomalies of termination include coronary fistula, coronary arcade, or extracardiac termination.<sup>2</sup> LM congenital anomalies comprise ectopy, atresia, and agenesis. Ectopic LM artery is most frequently localized in the opposite or non-coronary sinus of Valsalva and sometimes shares single coronary ostium with the RCA. In Bland-White-Garland syndrome, the ectopic vessel originates from the pulmonary artery in very symptomatic pediatric patients. LM coronary atrophy/agenesis has been described in the literature and often coexists with other multiple congenital anomalies.<sup>3,7-9,12</sup> It is characterized by either total absence of LM ostium or presence of its remnant that has no contact with the rest of the left coronary system. Left-sided arteries

of the heart. This variant should be distinguished from another congenital anomaly, namely LM atresia/agenesis. In single RCA, all branches create one functional and anatomical system, while in LM atresia there are two systems that are connected by clear collateral circulation from right to the left via conus branch artery (Vieussens' anastomoses), anterior ventricular branches of RCA, or branches supplying the LAD through the right posterior descending artery (PDA).<sup>10</sup> LM atresia usually demonstrates significant clinical consequences, while single RCA does not.<sup>11</sup> LM atresia/agenesis is extremely rare, and is usually diagnosed in early childhood in very sick patients who present with myocardial infarction, syncope, or failure to thrive. In older patients, symptoms such as dyspnea and angina appear when collaterals prove unable to cope with growing heart demands. Untreated LM atresia leads to serious consequences in both groups, with many patients dying suddenly. However, when treated (most often with surgical reconstruction of LM or bypass surgery), they fare well.<sup>12</sup> Atherosclerotic occlusion of LM artery is another condition that portends a poor outcome and needs to be distinguished from single RCA.<sup>13</sup> The prognosis in coronary artery anomalies is unclear. According to Van Camp et al, they may be responsible for 11.8% of deaths among United





**Figure 6.** Schematic drawing of single coronary artery. CX = circumflex; LAD = left anterior descending; PDA = posterior descending artery.



**Figure 7.** Cross-section of aortic root with single coronary artery in magnetic resonance imaging.

States school and college athletes. In the Sudden Death Committee of the American Heart Association, this figure is even higher, reaching 19%. In the literature, the incidence of coronary artery anomaly is approximately 1%.<sup>1</sup> Angelini et al found a much higher value of 5.6% based on 1950 angiograms.<sup>23</sup> In an American Armed Forces Institute database of 6.3 million 18-year-old recruits who were subjected to strenuous exercise during their training, there were 277 deaths not attributed to trauma. Cardiac cause was found in 64 individuals, of which 21 (33%) were due to left coronary artery anomaly originating from the opposite sinus. No other coronary artery anomaly could have been linked to their deaths. SCA seems to confer good prognosis unless one of its branches has interarterial course (ie, the artery lies between the aorta and pulmonary trunk). The latter variant is associated with poor prognosis, but the mechanism remains

unclear. The proposed explanations are: compression of the aberrant artery between main arteries during strenuous exercise, intramural course of the coronary artery in the aorta, and smaller cross-sectional area of the affected artery.<sup>14</sup>

SCA patients may remain asymptomatic as long as the artery is not affected by atherosclerosis. The question of susceptibility of anomalous arteries to atherosclerosis is still unresolved. According to the majority of reports, such risk is not higher than in normal arteries.<sup>1</sup> One might speculate that patients with SCA have higher risk of death due to the amount of myocardium supplied by just one vessel. Some authors assume that revascularization should be driven by documented coronary atherosclerosis and ischemia since the prognosis of SCA is not clear and there are no guidelines for its treatment.<sup>15</sup>

In the literature, we have found several case reports of percutaneous coronary interventions in patients with SCAs.<sup>16-22</sup> All of them were performed on distal branches of a single artery. As in the case in our patient, some of them were performed in acute coronary syndrome setting. However, to our knowledge, this is the first case of primary percutaneous coronary intervention in a patient with variant IIA SCA (Shirani and Roberts classification). Moreover, it is so far the first report of successful percutaneous intervention in a case of proximal occlusion of a SCA. Interestingly, during the acute event, the patient was free of ventricular arrhythmia or cardiogenic shock and did not require any form of cardiac support. On follow-up angiography, we confirmed good short-term result. Bearing in mind the importance of the coronary vessel patency, we planned 1 year angiographic follow-up as well.

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