

# Single Coronary Artery Presenting as Acute Coronary Syndrome with Sudden Cardiac Death

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**S**ingle coronary artery (SCA) is a rare congenital anomaly, which is defined as a single artery that arises from the aortic trunk from a single coronary ostium and supplies the entire heart regardless of its distribution [1]. Approximately 0.2–1.4% of symptomatic adult patients undergoing coronary angiography show variations in the coronary arterial anatomy, of which SCA is one [2,3]. The prevalence of SCA as an isolated finding is very low: 0.022% to 0.066% in the general population [1,4]. Lipton and colleagues [1] proposed a useful angiographic classification in 1979 that combined two previous classification [2]. This classification was further modified in 1990 by Yamanaka and Hobbs [3]. SCA is first designated with “R” or “L” depending upon whether the ostium is located in the right or left sinus of valsalva and further divided into three groups. In group I, either a right or left coronary artery perfuses the entire myocardium. Group II anomalies arise from the proximal part of the normal right or left coronary artery and cross the base of the heart before assuming the normal position of the inherent coronary artery. Group III includes patients with anomalies in which the left anterior descending arteries (LAD) and left circumflex (LCX) arise separately from the proximal part of the normal right coronary artery (RCA) [1,3].

Most SCA (80%) are benign and are encountered as a coincidental finding dur-

ing angiography [3,4]. In the rest of the cases, SCA can present as a life-threatening situation, such as arrhythmias, syncope, myocardial infarction, or sudden death [3-5].

## PATIENT DESCRIPTION

A 62 year old man with a history of obesity, hypertension, dyslipidemic, and smoking was admitted to our intensive cardiac care unit (ICCU) after he collapsed at his home. He had previously complained of chest pains. Basic resuscitation maneuvers were started by family members and neighbors and continued until the emergency services had arrived.

The first rhythm recorded was ventricular fibrillation, and advanced life support was started, including defibrillation and medication. Treatment was followed by restoration of spontaneous circulation. An electrocardiography recording, once spontaneous circulation was restored, showed extreme bradycardia with wide complex QRS and ST segment elevation at lead I and AVL and deep ST depression in the chest leads.

At arrival to the ICCU, the patient was unconscious and in cardiogenic shock with extreme bradycardia. Admission laboratory exams showed a severe leukomoid reaction with 34,000 white blood cells. Laboratory measures included hemoglobin concentration of 14 g/dl and a creatine level of 1.19 mg/dl with no electrolyte disturbances. Initially, troponin was 0.33 ng/ml and creatine phosphokinase was 509 U/L. Arterial blood gas analysis showed severe combined metabolic and respiratory acidosis with pH of 6.8.

The patient was transferred directly to the catheterization lab, where a temporary

pacemaker was inserted and vasopressor support was initiated. The access was through the right femoral artery. The standard 6Fr left Judkins catheter (Medtronic, USA) was unable to intubate the left main coronary artery. The smooth aortic wall visualized when a non-selective contrast was injected into the left aortic cusp. Selective right coronary arteriography revealed a single ostium in the right sinus of valsalva, giving rise to the RCA, LCX, and LAD. This ostium arises separately from a common tract from the proximal part of the normal RCA. This configuration is consistent with R-III type single coronary artery according to Lipton classification [Figure 1]. A fresh thrombus was demonstrated at the ostial part the LCX artery. An amplatz right I catheter (Medtronic, USA) was selected to complete the angioplastic procedure.

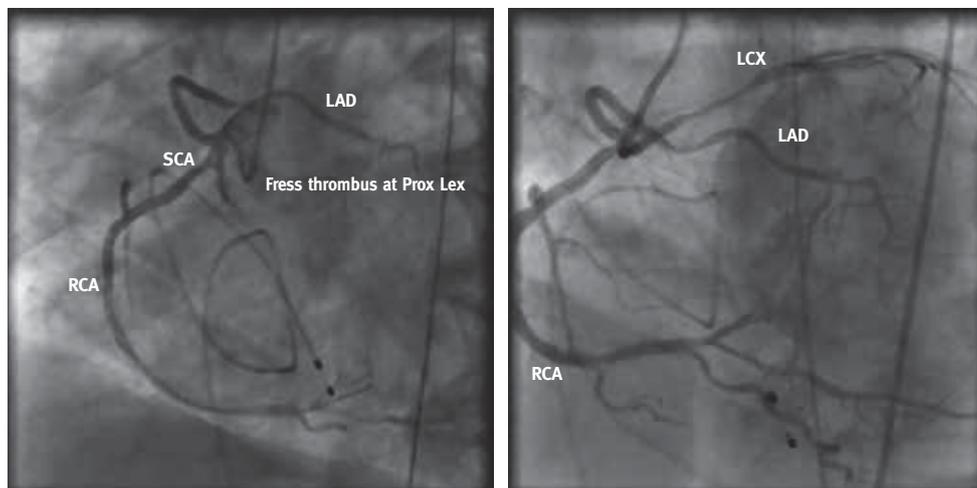
Using two regular floppy wires, we stabilized the system across the RCA and crossed through the lesion at the LCX without restoration of flow. We opted to restore the flow after lesion preparation with an under sized balloon and then deployed a drug eluting stent to the proximal part of the LCX.

Another non-occlusive thrombus was demonstrated at the proximal part of the RCA, which was treated with an implantation of a drug eluting stent without predilation.

During the time at the catheterization laboratory, the patient's condition remained unstable necessitating the use of intravenous inotropic agents. We did not initiate the use of an intra-aortic counterpulsation balloon or IIb/IIIa due to spontaneous bleeding through the endotracheal tube and nasogastric tube.

Hours later, in the ICCU, his condition continued to be critical and to further

**Figure 1.** A coronary angiogram showing the SCA arising from the right coronary cusp from a common tract that divided into the LAD, LCX, and RCA. The arrow marks the thrombus occluding the prox LCX



SCA = single coronary artery, LAD = left anterior descending arteries, LCX = left circumflex, RCA = right coronary artery

deteriorate, although he received optimal medical therapy. Several hours after admission, the patient died.

### COMMENT

SCA is a rare anatomical defect and its association with acute myocardial infarction is unusual, with few cases having been reported in the literature and even fewer reports of percutaneous coronary intervention performed in R-III-type single RCA anomalies [4,5].

Our case shows a patient who presented with SCD resulting from acute myocardial infarction due to atherothrombotic disease complicated by cardiogenic shock. Coronary angiography revealed SCA arising from the right sinus of valsalva with R-III type single coronary artery according to Lipton's classification [1]. The R-II, R-III, L-II, and L-III types are more commonly seen anomalies [1-3] and can show more

severe clinical courses. SCA could be considered as a benign anomaly mainly because cardiac function is normal as long as the perfusion to the myocardium is adequate. Although the prognosis of patients with SCA is unclear, major cardiac events occur in younger populations with an increased risk for sudden cardiac death either from impairment of coronary flow due to their course between the two great arteries or acute angle takeoff, or by inter-arterial course. Furthermore, patients with SCA are prone to develop atherosclerosis disease, which can result in severe consequences and complications mainly due to the lack of collateral circulation [5], as seen in our case.

### CONCLUSIONS

SCA is a very rare anomaly when present as an isolated defect. SCA arising from the right coronary cusp may lead to a fatal outcome, particularly when it is associated with atherosclerotic disease.

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**“Whenever you commend, add your reasons for doing so; it is this which distinguishes the approbation of a man of sense from the flattery of sycophants and admiration of fools”**

Sir Richard Steele, (1672–1729), Irish writer, playwright, and politician

**“Discovery consists of looking at the same thing as everyone else does and thinking something different”**

Albert Szent-Gyorgyi, (1893–1986), Hungarian biochemist who won the Nobel Prize in Physiology or Medicine in 1937. He is credited with discovering vitamin C and the components and reactions of the citric acid cycle