# Primary angioplasty of an anomalous right coronary artery complicated by an acute thrombotic occlusion

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**A right coronary artery (RCA) arising from the left main is a very uncommon congenital defect. We report on a 69-year-old patient with an acute myocardial infarction submitted to primary percutaneous coronary intervention (PCI) for an anomalous RCA. The PCI procedure was complicated by an acute thrombotic occlusion, successfully treated by an intracoronary bolus of abciximab.**

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## Introduction

In the general population congenital coronary anomalies are very uncommon[1,2]. Coronary artery anomalies may manifest with various clinical pictures, probably in relation to their anatomic course[2]. An aberrant origin of the right coronary artery (RCA) from the left main coronary artery is one of the anomalies most frequently associated with malignant clinical events, and surgical treatment is recommended[3].

Few case reports in the literature have described percutaneous transluminal coronary angioplasty (PTCA) in patients with coronary artery anomalies[4-6], even less in the acute phase of myocardial infarction[7,8] and never on an anomalous RCA. Moreover, it is well known that PTCA and stenting carry the risk of mobilizing thrombotic and thrombogenic material with a possible acute thrombotic occlusion. Many mechanical devices and pharmacological interventions have been applied in order to deal with this dreadful complication[9]. The use of an intracoronary bolus of abciximab has been associated with rapid thrombus dissolution during elective or primary PTCA[10].

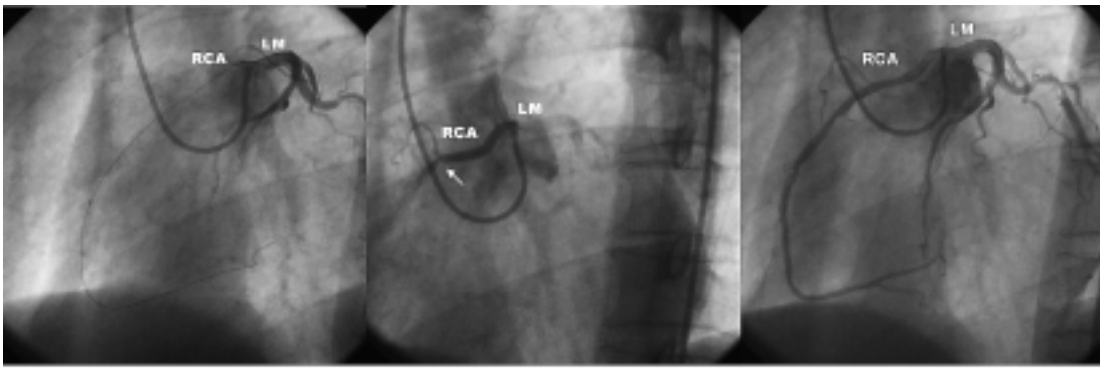
## Case report

A 69-year-old male, with a history of hypertension and hypercholesterolemia and complaining of chest pain radiating to both arms and moderate-exertion dyspnea, was referred to a local hospital. The ECG documented a 3 mm ST-segment elevation in the inferior leads with a significant elevation of the creatine kinase-MB and troponin I serum levels.

One hundred and forty minutes following the onset of symptoms, 300 mg clopidogrel was administered and he was transferred to our Department for primary angioplasty. At admission, the patient did not present any sign of pulmonary congestion (Killip class 1). His blood pressure was 110/70 mmHg with persistent angina and ST-segment elevation at ECG.

After 5000 IU of heparin and abciximab at a standard dosage of 0.25 mg/kg in intravenous bolus followed by 0.125 μg/kg/min by continuous intravenous infusion, we proceeded to selective left coronary artery catheterization that revealed the presence of a totally occluded anomalous RCA arising from the left main coronary artery (Fig. 1A).

A 0.014-inch BMW guide wire (Guidant, Indianapolis, IN, USA) was pushed forward in the occluded RCA which immediately acquired a TIMI 1 flow. A significantly long tract of the mid-segment was found to be stenosed (Fig. 1B). Predilation of the lesion performed using a Maverick 1.5 OTW balloon (Boston Scientific, Natick, MA, USA) inflated to 14 atm for 55 s resulted in the restoration of a TIMI 3 flow. A Zeta 3.0 × 13 mm stent (Guidant, Indianapolis, IN, USA) was then implanted with an apparently perfect deployment of the stent (Fig. 1C) and relief of symptoms.




A B C

**Figure 1.** *Selective angiography of the left coronary artery (left anterior oblique 55°).* Panel A: *occluded right coronary artery (RCA) arising from the left main coronary artery (LM).* Panel B: *significant stenosis* (arrow) *of the mid-segment of the anomalous RCA.* Panel C*: recanalized RCA after the first stent implantation.*

Then, after less than 1 min, an acute thrombotic occlusion (TIMI 2 flow) was observed downstream from the stent (Fig. 2A). The patient again presented with angina without any change at ECG. Therefore, 10 mg of intracoronary abciximab were administered with rapid and complete thrombus dissolution (Fig. 2B). The patient's clinical conditions stabilized within a few minutes.

In view of the presence of another lesion downstream and adjacent to the distal edge of the previously positioned stent, a Carbostent 3.0 × 9 mm (Sorin Biomedica, Soluggia-VC, Italy) was deployed (Fig. 2C) with optimal recanalization of the vascular lumen (TIMI 3 flow).

The patient did not present with any postoperative complications and there was no further elevation in the serum levels of the cardiac necrosis markers. His ECG returned to normal.

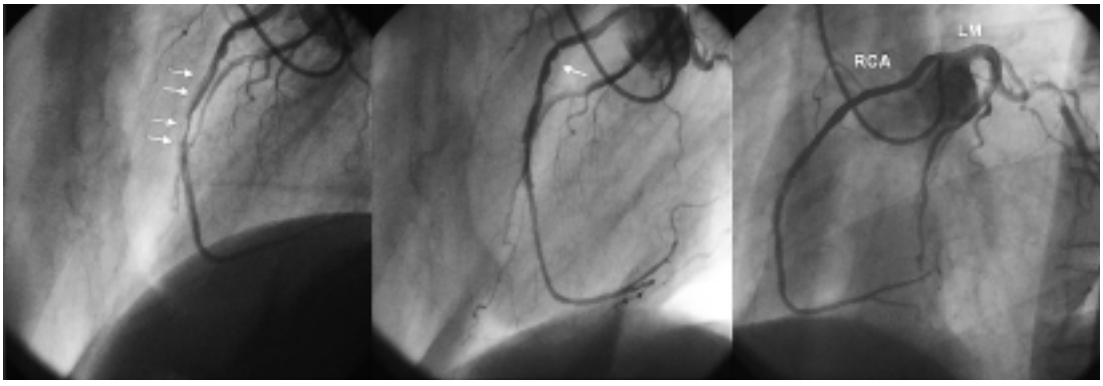
At 6 months of follow-up, the patient was in good clinical conditions and did not refer any recurrent episodes of angina. Transesophageal echocardiography revealed that the RCA ran between the aorta and pulmonary artery (Fig. 3). It also revealed hypokinesis of the inferior wall (ejection fraction 50%).

## Discussion

The incidence of congenital anomalous coronary arteries (ACA) in the general population is reported to be between 0.46 and 1.55%[2].

Their clinical relevance varies widely. They may be clinically silent and totally benign, or may cause many adverse clinical events and even sudden cardiac death resulting in significant morbidity and mortality, even among young adults.

A widely accepted pathophysiologic mechanism to explain this finding is that some malignant ACA follow an anomalous course between the great vessels before reaching their normal location. Thus, the aorta and pulmonary artery impinge on the proximal anomalous vessel, especially during exercise when the aorta and pul-




A B C

**Figure 2.** Panel A: *acute thrombus occlusion* (arrows) *downstream to the previously implanted stent.* Panel B: *complete thrombus resolution following the administration of an intracoronary bolus of abciximab.* Panel C: *optimal recanalization of the right coronary artery (RCA) after a new stent deployment. LM = left main coronary artery.*

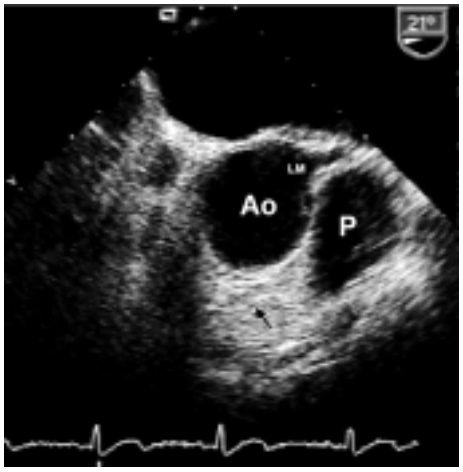



**Figure 3.** *Transesophageal echocardiography (basal view, short axis, 21°). The right coronary artery arising from the left main coronary artery (LM) with an anomalous course* (arrow) *between the aorta (Ao) and pulmonary trunk (P).*

monary artery dilate in response to the increased cardiac output, coincident with an increased coronary flow demand[2]. This has been recently suggested by a perfusion cardiovascular magnetic resonance study[11], a Tc-99m stress-rest myocardial perfusion scintigraphic assessment[12] and an intravascular ultrasonographic evaluation[13].

Therefore, defining both the presence and the proximal course with respect to the aorta and pulmonary artery is essential to distinguish a malignant from a benign disorder.

Understanding the course of the vessel only on the basis of a coronary angiogram may be difficult. In fact, this technique only provides a two-dimensional projection of the anomalous vessel and does not reliably delineate the proximal course of ACA in relation to the great vessels. On the other hand, the anomalous course of a proximal coronary artery may also be reliably identified with transesophageal echocardiography and numerous reports in the literature have documented the usefulness of this diagnostic technique in such cases[14,15].

An aberrant origin of the left main stem from the right aortic sinus of Valsalva, and of the RCA from the left aortic sinus of Valsalva, as in this case, are the most common anomalies associated with angina pectoris, myocardial infarction or sudden cardiac death[3] probably because of an abnormal proximal course and an altered myocardial perfusion. For these two coronary anomalies, a malignant prognosis is assigned and surgical treatment is recommended.

The introduction of coronary stents has accelerated the tendency to substitute catheter angioplasty for bypass surgery. Moreover, in ACA patients, surgical reimplantation of the ectopic vessel is quite complex and has unpredictable results, chiefly because of the difficulty in creating the proximal anastomoses and due to the possibility of impairing aortic valve function[16,17]. Several considerations are relevant in judging the value of coronary stenting in patients with ACA. The anatomy of ACA is often quite different from that usually seen in atherosclerotic disease[18]. The anomalous artery's ostium is ectopic, and is hard to reach with a guiding catheter designed for the normal coronary anatomy. Even if the ectopic ostium is reachable with the guiding catheter, cannulation and institution of coaxiality, with adequate back-up support, is frequently difficult. Indeed, the ectopic ostium is usually juxtacommissural, and the proximal course of the ectopic artery is tangential to the aortic wall. As already described, a PTCA procedure in patients with an anomalous origin of a coronary artery could be difficult[4-6,19], even more so during the acute phase of myocardial infarction[7,8], and it must be performed with care because dissection or acute thrombotic occlusion of the common proximal section could be fatal. However, in the latter cases described in the literature, transluminal angioplasty had been performed on a vessel with a normal anatomy, except for a case of PTCA performed during acute myocardial infarction (more than 6 hours following the onset of chest pain) on a left anterior descending coronary artery arising from a RCA[8] and never in elderly patients. This is in contrast with the aberrant coronary artery described in the present case.

Percutaneous coronary interventions, especially during the acute phase of myocardial infarction, carry the risk of mobilizing thrombotic and thrombogenic material with a possible acute thrombotic occlusion[9]. Nowadays, an intracoronary bolus of abciximab is routinely used in case of such acute complications and has been associated with a reduced incidence of major adverse cardiac events compared to the standard intravenous route[10].

This is the first case published in the literature of an early PTCA performed during an acute myocardial infarction on a RCA with an anomalous origin and course between the great vessels. Moreover, this is also the first description of the intracoronary use of abciximab in an elderly patient with ACA.

## References

1. Yamanaka O, Hobbs RE. Coronary artery anomalies in 12 595 patients undergoing coronary arteriography. Cathet Cardiovasc Diagn 1990; 21: 28-40.
2. Angelini P, Velasco JA, Flamm S. Coronary anomalies. Incidence, pathophysiology, and clinical relevance. Circulation 2002; 105: 2449-54.
3. Kragel AH, Roberts WC. Anomalous origin of either the right or left main coronary artery from the aorta with subsequent coursing between aorta and pulmonary trunk: analysis of 32 necropsy cases. Am J Cardiol 1988; 62: 771-7.
4. Lanzieri M, Khabbaz K, Salomon RN, Kimmelstiel C. Primary angioplasty of an anomalous left main coronary artery: diagnostic and technical considerations. Catheter Cardiovasc Interv 2003; 58: 185-8.

5. Roffi M, Eberli FR, Wyttenbach R, Gallino A. Percutaneous coronary intervention of the left main trunk in congenitally anomalous single coronary artery. J Invasive Cardiol 2001; 13: 808-9.
6. Pomar F, Castello T, Velasco J. Stenting in a patient with single coronary artery and myocardial infarction. J Invasive Cardiol 1999; 11: 685-7.
7. Baljepally RM, Pollock SH, Magram MY. Transluminal angioplasty of a single coronary artery anomaly during acute myocardial infarction - a case report. Angiology 1993; 44: 981-4.
8. Boulet V, Lipiecki J, Philippot F, et al. Transluminal angioplasty in a patient with a single coronary artery during the acute phase of a myocardial infarction. J Interv Cardiol 2003; 16: 371-4.
9. Rentrop KP. Thrombi in acute coronary syndromes. Revisited and revised. Circulation 2000; 101: 1619-26.
10. Wohrle J, Grebe OC, Nusser T, et al. Reduction of major adverse cardiac events with intracoronary compare intravenous bolus application of abciximab in patients with acute myocardial infarction or unstable angina undergoing coronary angioplasty. Circulation 2003; 107: 1840-3.
11. Bunce NH, Rahman SL, Keegan J, et al. Anomalous coronary arteries: anatomic and functional assessment by coronary and perfusion cardiovascular magnetic resonance in three sisters. J Cardiovasc Magn Reson 2001; 3: 361-9.
12. De Luca L, Bovenzi F, Rubini D, et al. Stress-rest myocardial perfusion SPECT for functional assessment of coronary arteries with anomalous origin or course. J Nucl Med 2004; 45: 532-6.
13. Angelini P, Velasco JA, Ott D, Khoshnevis GR. Anomalous coronary artery arising from the opposite sinus: descriptive features and pathophysiologic mechanisms, as documented by intravascular ultrasonography. J Invasive Cardiol 2003; 15: 507-14.
14. Fernandes F, Alam M, Smith S, et al. The role of transesophageal echocardiography in identifying anomalous coronary arteries. Circulation 1993; 88: 2532-40.
15. De Luca L, Bovenzi F, de Luca I. Congenital coronary artery anomaly simulating an acute aortic dissection. Heart 2003; 90: E11.
16. Fernandes ED, Kadivar H, Hallman GL, et al. Congenital malformations of the coronary arteries: the Texas Heart Institute experience. Ann Thorac Surg 1992; 54: 732-40.
17. Rinaldi RG, Carballido J, Giles R, et al. Right coronary artery with anomalous origin and slit ostium. Ann Thorac Surg 1994; 58: 829-32.
18. Hariharan R, Kacere RD, Angelini P. Can stent-angioplasty be a valid alternative to surgery when revascularization is indicated for anomalous origination of a coronary artery from the opposite sinus? Tex Heart Inst J 2002; 29: 308-13.
19. Topaz O, Di Sciascio G, Goudreau E, et al. Coronary angioplasty of anomalous coronary arteries: notes on technical aspects. Cathet Cardiovasc Diagn 1990; 21: 106-11.