



## Percutaneous Coronary Intervention and Complete Revascularization of a Patient with Cardiogenic Shock and an Anomalous Left Main Artery Arising from the Right Sinus of Valsalva

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### Abstract

Anomalous origin of the Left Main Coronary Artery (LM) from the right sinus of Valsalva is a very rare congenital anomaly. We report a 67-year-old female presented with Acute Coronary Syndrome (ACS) and cardiogenic shock. The coronary angiogram showed the LM originating from the right coronary sinus, with a thrombotic lesion in the ostium of the circumflex artery and a chronic total occlusion of the Left Anterior Descending artery (LAD) and the Posterior Descending artery (PD). After percutaneous implantation of a circulatory support with Extracorporeal Membrane Oxygenation (ECMO) the patient was fully revascularized. The procedure was very difficult regarding the complex coronary anatomy and the presence of two chronic occlusion but the clinical evolution was favorable. This case highlights the benefits of complete revascularization in this particular situation and the importance of an appropriate circulatory support.

**Keywords:** Anomalous coronary artery; Congenital coronary artery; Cardiogenic shock; Chronic total occlusion

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### Introduction

Congenital Coronary Anomalies (CCA) are very rare. They are only present in 0.15% of the population, 0.5% for patients referred to catheterization diagnostic and 1.5% after cardiac computed tomography [1,2].

Coronary artery originating from contralateral sinus of Valsalva is a potentially serious anomaly with a risk of sudden cardiac death depending most of the presence of an aortic intramural segment or of an inter arterial course (where the anomalous artery passes between the pulmonary artery and the aorta) [3,4].

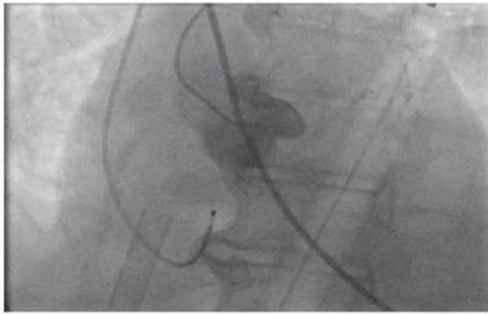
Coronary atherosclerosis of the anomalous arteries was found only in 28% of the patients while the overall incidence of atherosclerotic burden was 65% in a retrospective registry of 13010 adults who underwent diagnostic coronary arteriography [5].

Thus, anomalous coronary arteries do not appear to be associated with an increased risk for development of coronary atherosclerosis [5]. There are very limited numbers of cases reports with patients treated by percutaneous interventions for severe stenotic lesion in the anomalous coronary artery in stable condition or even in acute phase.

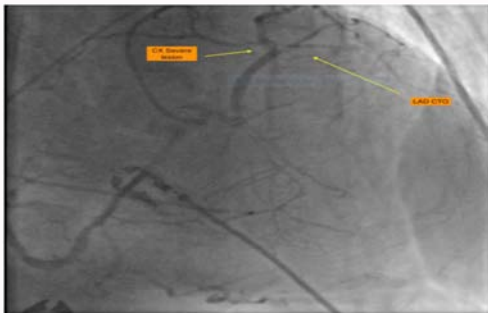
### Case Presentation

A 67-year-old female patient with a past medical history of arterial hypertension, dyslipidemia, diabetes and chronic severe renal failure was admitted at our hospital for acute coronary syndrome. The echocardiography showed a severe bi ventricular failure with a left ejection fraction of 20%. The patient developed a complete atrio-ventricular block and becomes hemodynamically unstable despite the placement of a temporary pace lead and fluids administration. A percutaneous mechanical circulatory support by veno-arterial Extracorporeal Membrane Oxygenation (ECMO) was needed before starting the angiogram.

The patient has a moderate disease of the middle part of the right coronary artery and a chronic



**Figure 1:** The left system couldn't be engage with: Extra Back Up 3.5/3.75, Judkins Left 4, Amplatz Left.



**Figure 2:** The interventricular artery was occluded in the proximal part and the circumflex artery presented an ostial non-occlusive thrombotic lesion.

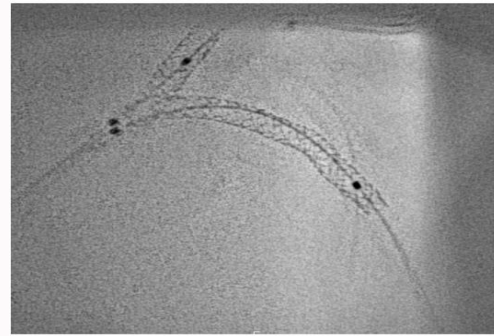


**Figure 3:** CTO PCI of the LAD with one everolimus drug eluting stent (2.5 mm x 28 mm) implanted.

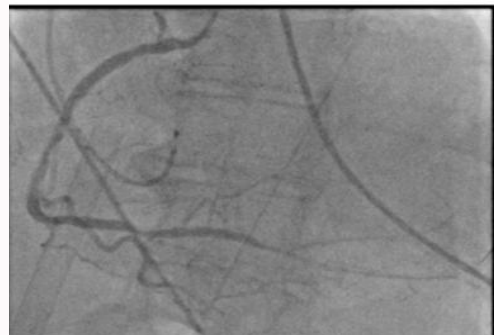
occlusion of posterior descending artery (Figure 3). The left system couldn't be engaging despite the use of multiples guiding catheters like (Extra Back Up 3.5/3.75, Judkins Left 4, Amplatz Left 1) (Figure 1).

A non-selective injection of the right coronary artery by Judkins Right 4 catheters allowed us to visualize an anomalous origin of the left main arising near the ostium of the right coronary artery. The interventricular artery was occluded in the proximal part and the circumflex artery presented an ostial non-occlusive thrombotic lesion (Figure 2). After the initials pictures was difficult to establish if the LAD occlusion was chronic. We decided to attempt a complete revascularization regarding the high surgical risk and in presence of an acute coronary syndrome with refractory cardiogenic shock.

The PCI of the distal left main was performed with a Judkins Right guiding catheter. The crossing of the total occlusion of the LAD was difficult, after a first try with a workhouse guide wire Sion



**Figure 4:** PCI LM using two-stents technique - TAP (T-stenting and small protrusion).



**Figure 5:** Final result after CTO PCI of the posterior descending artery with one everolimus drug eluting stent.

Bleu and a Fielder XTA an intermediate stiff guidewire Gaia second could penetrate the hard tissue (reflecting the presence of a chronic occlusion). After exchange the Gaia with a work house guide wire, the lesion was prepared by multiple dilatations and an everolimus drug eluting stent (2.5 mm x 28 mm) was implanted (Figure 4).

Another drug eluting stent (3 x 24) was placed from the left main to circumflex artery followed by a POT (proximal optimisation technique). The wires were exchanges and after the opening of the cell struts toward LAD a drug elution stent (2.5 x 24) was implanted from the ostium using the TAP technique (T-stenting and small protrusion) (Figure 5).

With the same guiding catheter Judkins Right and by a Corsair microcatheter a Gaia second crossed the posterior descending occlusion after multiple tries with more soft wires like Sion Black and Fielder XTA. The lesion was prepared by balloon dilatation and a everolimus drug eluting stent (2.75 x 20) was implanted with a good final result.

The clinical evolution was favorable with ECMO been successfully stopped after 48 h and a total length of 10 days in intensive care unit. After 3 months of clinical follow up the patient was free from hospitalization.

### Discussion

The percutaneous interventions in the presence of anomalous coronary arteries are very rare. The others particularities of our case are the presence of multivessel complex coronary artery disease with two CTO and a distal LM plaque in a patient with cardiogenic shock and considered inoperable by our surgical team.

The early implantation of ECMO before starting the procedure was very helpful in our opinion. The decision to perform a complete revascularization was related to a very poor left ventricular function and the high risk of been unable to stop the ECMO in case of PCI only of the culprit vessel.

Another reason to treat all three vessels was the difficult interpretation of the coronary angiogram due to «unusual» anatomy and the possibility that the occlusion of the LAD or the PD could be acute. The behavior of the wires and the passage only by stiff CTO wires proved that the occlusion was chronic.

The PCI to anomalous coronary arteries is technical difficult considering the poor stability and support of the guiding catheter. The microcatheter and the guiding extension was very helpful for enhance the support of the wire and to deliver the balloons and stents.

In our opinion in this particular case the complete revascularization was essential for the improvement of the hemodynamics and for the favorable clinical evolution.

## Conclusion

We report a very rare case of anomalous coronary arteries associated with complex lesions in a context of cardiogenic shock. In this particular situation in our opinion the treatment of the 2 chronic total occlusion and the distal left main protected by the mechanical circulatory support was determinant for the outcome of the patient.

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