

Recurrent Percutaneous Coronary Interventions in a Patient With a Single Coronary Ostium Arising From the Right Coronary Sinus: An 18-Year Clinical Course

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Abstract

This report describes an 18-year longitudinal clinical course of a patient with a rare single coronary ostium originating from the right coronary sinus. The patient underwent percutaneous coronary intervention (PCI) with bare-metal stents (BMS) to the proximal left anterior descending artery (LAD) and proximal right coronary artery (RCA) in 2007, with complete long-term patency and no restenosis for nearly two decades.

In August 2025, he presented with non-ST-segment elevation acute coronary syndrome (NSTEMI-ACS) caused by a new, heavily calcified 99% mid-LAD stenosis. PCI required high-pressure plaque modification using OPN super-high-pressure balloons up to 50 atm, followed by deployment of a drug-eluting stent (DES) with an excellent angiographic result. One month later, elective PCI addressed severe proximal circumflex (LCx) stenosis and a high-grade obtuse marginal (OM) branch lesion, treated with DES and drug-eluting balloon (DEB) therapy, respectively.

This case highlights the natural history of coronary atherosclerosis in congenital coronary anomalies, the long-term durability of early-generation BMS, and the technical challenges posed by extreme calcification. It underscores the importance of lifelong surveillance and tailored revascularization strategies in patients with single-ostium coronary anatomy.

Key-words

Congenital coronary vessel anomalies, single coronary artery, percutaneous coronary intervention, super-high pressure balloon, drug eluting stents

Introduction

Anatomical definition of the normal coronary circulation, as proposed by Angelini, identifies three principal vessels: the right coronary artery supplying the right ventricular free wall; the left anterior descending artery supplying the anterior interventricular septum; and the circumflex artery supplying the free lateral wall of the left ventricle¹. The earliest anatomical depictions—including those by Leonardo da Vinci—already recognised distinct epicardial pathways. Congenital coronary artery anomalies occur in less than 1% of the population, with a single coronary ostium representing fewer than 0.04% of cases²⁻³. A solitary ostium arising from the right coronary sinus is particularly rare and may be associated with potentially malignant inter-arterial courses, altered shear stress patterns, vulnerability to atherosclerotic progression, and procedural complexity during coronary intervention. Clinical outcomes in such patients depend on underlying anatomy, cumulative coronary disease burden, and the evolution of PCI technologies over time⁴.

The different view point of the surgeon and interventionist compared to the imager⁵. To be clear our case anomaly was single coronary artery and retro aortic route of the LAD and Cx separated early from the short LM rising

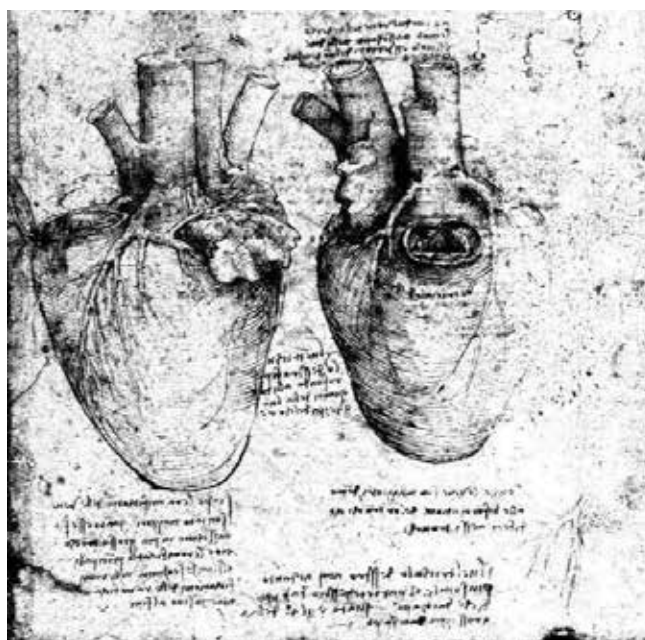


Figure 1. Leonardo da Vinci's drawings

in the right sinus of Valsalva. In 1990 Yamanaka O and Hobbs updated earlier Lipton classification of Coronary artery anomalies exploring them in 126,595 patients undergoing coronary arteriography in Cleveland Clinic².

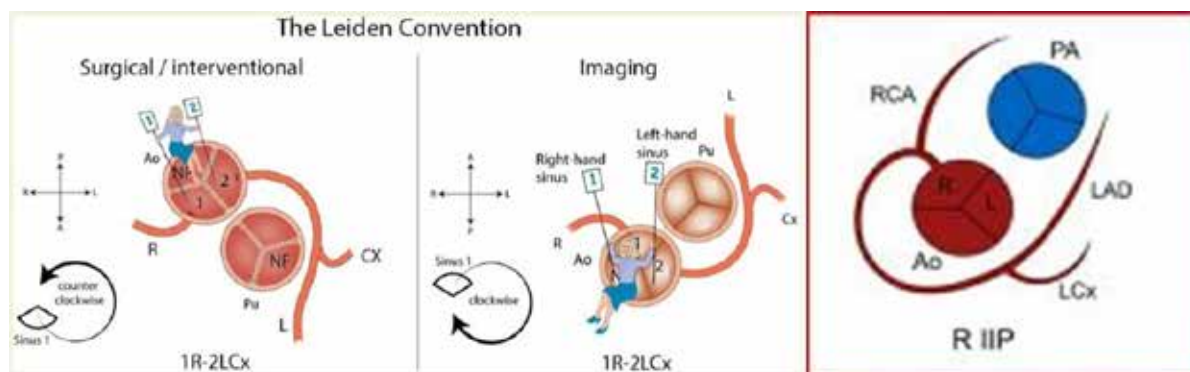


Figure 2. Leiden convention and Lipton classification

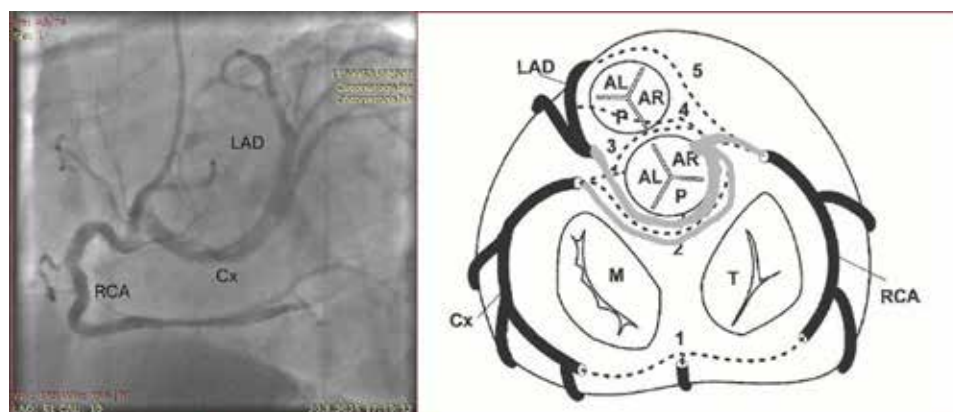


Figure 3. Our patient anatomy showing Single Coronary Artery and retro aortic path of LAD and Cx, they divide after short LM

We report the full 18-year course of a patient with a single coronary ostium from the right sinus who underwent PCI in 2007 and subsequently required two further revascularisation procedures in 2025. The case illustrates the interplay between congenital anatomy, disease progression, and modern interventional techniques.

Case Presentation

Baseline Anatomy and First PCI (2007)

A 54-year-old male with hypertension and chronic nicotine exposure underwent coronary angiography for exertional angina in 2007. At first right Judkins was unable to cannulate the ostium so we switch to Guiding Right AL2 and we engage the single ostium for whole coronary system. Imaging demonstrated a single coronary ostium in the right sinus of Valsalva, giving rise to the RCA and a short left main artery before bifurcating into the LAD and LCx with a retro-aortic course. Significant proximal stenoses of both the LAD and RCA were treated. We identify 99% stenosis of pRCA and 90% stenosis of pLAD. There were also several plaques downstream from that stenosis but at that time without clinical significance. He received on pRCA 3.5/15 BMS on 18 atm and in the same time on pLAD one 4.0/18 BMS at 18 atmospheres of pressure. The procedure was uneventful, and the patient remained asymptomatic for years.

Long-Term Clinical Course (2007–2025)

The patient did not attend routine cardiology follow-up due to longstanding fear of hospitals. He remained as-

ymptomatic and physically active as a manual agricultural worker. In 2025—18 years after his initial PCI—repeat angiography confirmed complete patency of both BMS without restenosis.

Acute Coronary Syndrome — August 2025 Presentation

In August 2025, the patient presented with severe chest pain and elevated troponin levels consistent with NSTEMI-ACS.

Angiographic Findings

Repeat angiography confirmed the unchanged single-ostium anatomy and widely patent 2007 BMS. However, a new 99% stenosis with concentric heavy calcification had developed in the mid-LAD at a site that showed only mild irregularity in 2007.

PCI Procedure

Multiple compliant and non-compliant balloons ruptured around 10 atm due to the sharp and rigid calcium. A non-compliant balloon showed a severe hourglass (“sand-clock”) waist even at 24 atm, indicating an undilatable lesion. We used many conventional tricks but effect was rather small not sufficient to proceed with stent implantation⁶. Lesion preparation required OPN super-high-pressure balloons (2.5 × 10 mm and 3.0 × 15 mm) inflated to 50 atm, resulting in partial modification and a controlled dissection without flow compromise. A 3.0 × 30 mm DES was deployed at 16 atm with optimal expansion and TIMI-3 flow. The patient was discharged the next morning.

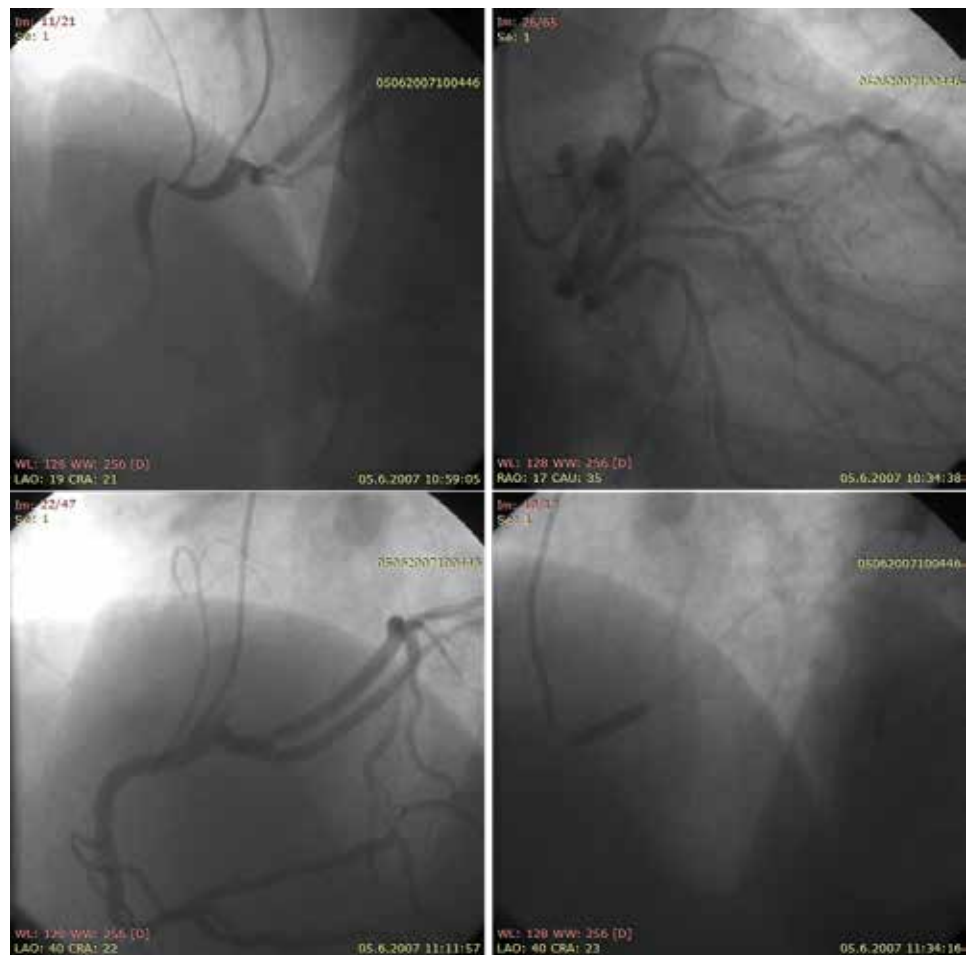


Figure 4. Our surprise

Elective PCI — September 2025

Findings

One month later, the mid-LAD DES remained patent, although with mild peri-stent contrast staining at the previously calcified segment. Additional lesions were noted:

- 90% proximal LCx stenosis
- 95% high-grade OM lesion in a small-calibre (≈ 2 mm) branch
- 90% diagonal branch stenosis (asymptomatic; preserved flow)

The LCx lesion was treated with a new-generation DES. The OM lesion was treated with DEB angioplasty due to its small diameter. The diagonal branch lesion was left untreated because the patient was asymptomatic with good flow.

Discussion

1. Durability of Early-Generation BMS

The 2007 BMS remained widely patent after 18 years, with only mild ($<30\%$) restenosis in the RCA. Such long-term durability, though uncommon, has been documented in specific anatomical and procedural contexts.

2. Progression of Native-Vessel Atherosclerosis

The patient developed severe calcific disease in the mid-LAD rather than in-stent restenosis. Single-ostium coro-

nary anatomy may alter shear stress distribution, predisposing to progressive calcification.

3. Challenges in Treating Extreme Calcification

Conventional non-compliant balloons failed at pressures well above their rated limits. OPN balloons provided the necessary plaque modification and illustrate their value in focal, heavily calcified lesions, particularly when ana-

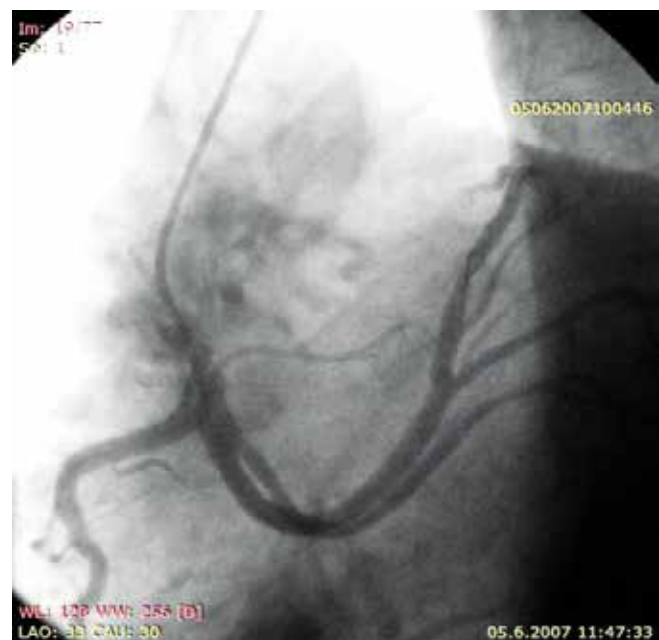


Figure 5. Final image after the procedure (2007)

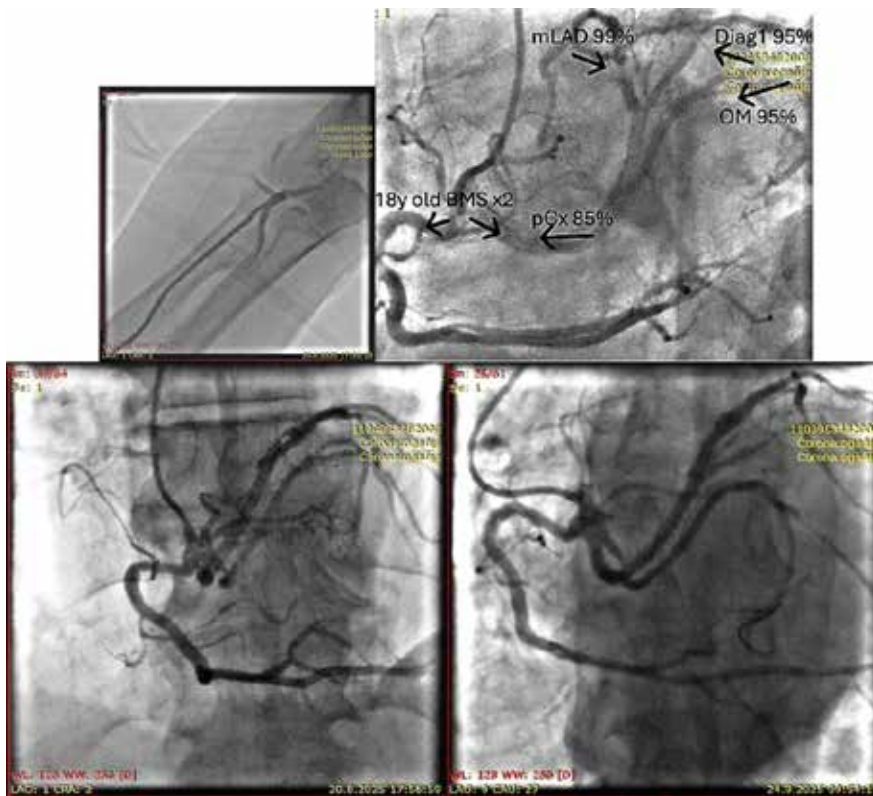


Figure 6. Coronary angiography: we meet the old forgotten friend again

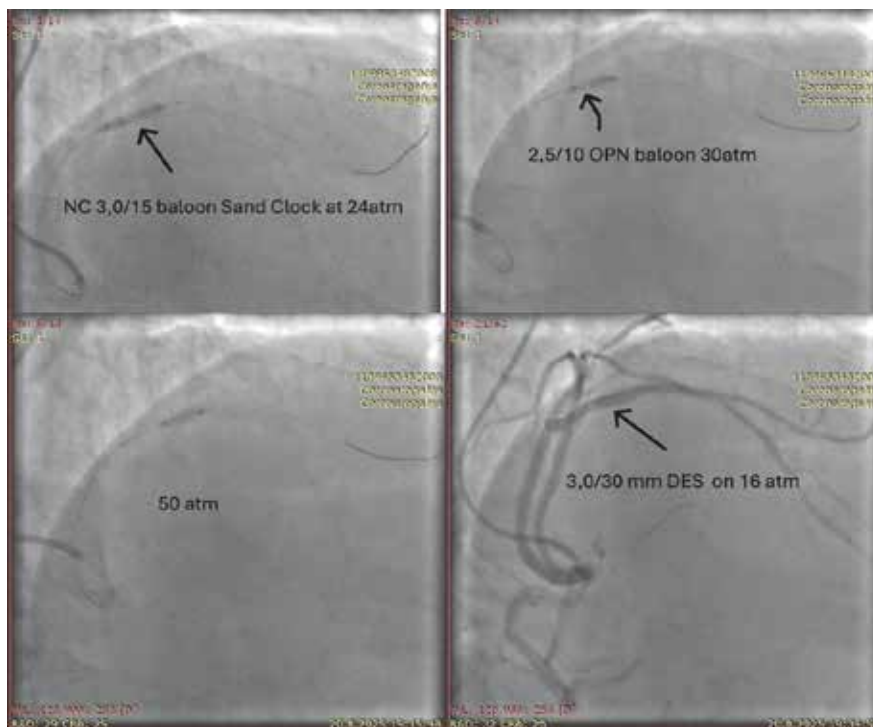


Figure 7. Multiple lesion preparation finally ended with super high pressure balloon inflation

tomical constraints or ostial anomalies may limit the use of atherectomy or intravascular lithotripsy.

4. Staged Multivessel Revascularisation

The combination of DES (LCx) and DEB (OM) reflects a contemporary, individualised PCI strategy. Deferral of the asymptomatic diagonal lesion was appropriate and guideline-consistent⁷.

5. Prognostic Considerations in Single Coronary Ostium

Although the patient had a benign retro-aortic course, congenital anomalies require lifelong clinical surveillance, as progression of native disease—not congenital anatomy—may become the dominant risk over time.

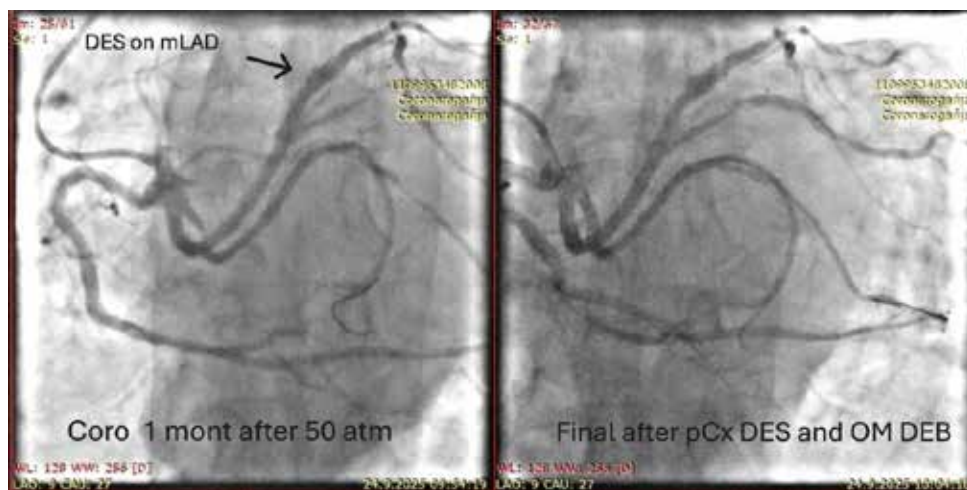


Figure 8. PCI No3 Procedure (one month after using the 50 atm balloon)

Conclusion

This case illustrates the convergence of congenital coronary anatomy, long-term stent behaviour, and modern interventional management of heavily calcified lesions. Despite rare anatomy, high-pressure lesion preparation, careful procedural planning, and staged PCI resulted in excellent outcomes. Lifelong follow-up remains essential in patients with a single coronary ostium, even when initial stent results appear durable.

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Sažetak

Ponovljena perkutana koronarna intervencija kod pacijenta sa jednim koronarnim otstupom iz desnog koronarnog sinusa: 18-godišnji klinički tok

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Ovaj rad opisuje 18-godišnji produženi klinički tok pacijenta sa retkim jednim koronarnim otstupom iz desnog koronarnog sinusa. Pacijent je podvrgnut perkutanoj koronarnoj intervenciji (PCI) sa stentovima bez leka (BMS) u proksimalnom segmentu leve prednje silazne arterije (pLAD) i proksimalnom segmentu desne koronarne arterije (pRCA) 2007. godine, sa kasnijom dugoročnom prohodnošću i bez restenoze implantiranog stenta skoro dve decenije. U avgustu 2025. godine, pacijent se klinički prezentuje sa akutnim koronarnim sindromom bez elevacije ST segmenta (NSTEMI-ACS) izazvanom novom, jako kalcifikovanom stenozom medijalnog segmenta LAD od 99%. PCI je zahtevala tretiranje plaka primenom balona sa visokim pritiskom (OPN balona super visokog pritiska do 50 atm), nakon čega je usledila implantacija stenta sa lekom (DES) uz odličan angiografski rezultat. Nakon mesec dana, sprovedena je elektivna perkutana koronarna intervencija (PCI) koja je rešila tešku stenozu na proksimalnom segmentu cirkumfleksne arterije (pLCx) i suokluzivnu leziju marginalne grane (OM), primenom DES-a i balonom obloženim lekom (DEB).

Ovaj slučaj ističe prirodni tok koronarne ateroskleroze kod kongenitalnih koronarnih anomalija, dugoročnu trajnost BMS rane generacije i tehničke izazove koje predstavlja ekstremna kalcifikacija. On naglašava važnost doživotnog praćenja i prilagođavanja strategije revaskularizacije kod pacijenata sa anatomijom jednog odступа koronarne arterije.

Ključne reči: urođene anomalije koronarnih arterija, perkutana koronarna intervencija, balon sa super visokim pritiskom, stent sa oslobađanjem leka