Case Report

Percutaneous coronary intervention in an anomalously arising totally occluded circumflex coronary artery

Cataldo Palmieri\textsuperscript{a}, Endrin Kont\textsuperscript{a}, Giuseppe Trianni\textsuperscript{a}, Marcello Ravani\textsuperscript{a}, Antonio Rizza\textsuperscript{a}, Marco Vaghetti\textsuperscript{a}, Alberto Ranieri De Caterina\textsuperscript{a,b,*}, Sergio Berti\textsuperscript{a}

\textsuperscript{a}Fondazione Toscana “G Monasterio”, Massa, Italy
\textsuperscript{b}Istituto Scienze della Vita, Scuola Superiore Sant’Anna, Pisa, Italy

\textbf{ARTICLE INFO}

Article history:
Received 16 September 2012
Received in revised form 19 October 2012
Accepted 20 October 2012
Available online 2 November 2012

Keywords:
Congenital coronary anomalies
Chronic total occlusion
Percutaneous coronary intervention

\textbf{ABSTRACT}

Congenital coronary anomalies are present in approximately 1% of the patients referred to cardiac catheterization. The present case describes a successful percutaneous coronary intervention in totally occluded left circumflex coronary artery (LCx) with an anomalous origin from right sinus of Valsalva. To the best of our knowledge this is the first case presented of successful recanalization of a chronic total occlusion in an anomalously arising LCx. The case highlights the feasibility of such a challenging procedure on the basis of the knowledge of coronary anatomy and the selection of appropriate guiding catheters and coronary wires.

© 2012 The Czech Society of Cardiology. Published by Elsevier Urban & Partner Sp.z.o.o. All rights reserved.

1. Introduction

Congenital coronary anomalies (CCA) are present in approximately 1% of patients referred to cardiac catheterization [1–3]. However, using the definition proposed by Angelini, which includes myocardial bridges and coronary fistulas as CCA, the incidence rises up to 5.64% [4].

Initially described by Antopol and Kugel in 1933 [5], an anomalous origin of the left circumflex coronary artery (LCx), arising either from the right coronary artery (RCA) or the right sinus of Valsalva, is reported to be found in 0.18%–0.67% at coronary angiography [1–3,6–8]. The anomalous LCx usually pursues a posterior retro-aortic course before supplying the postero-lateral surface of the left ventricular myocardium. Some debate exists whether these vessels are particularly prone to atherosclerosis, especially in their retro-aortic portion. Some authors, for instance, have demonstrated a very high likelihood of developing coronary atherosclerosis in this segment of the vessel [3,5,8–10], whereas others have failed to demonstrate this finding [2,4,6].

We present here a case of successful percutaneous coronary intervention in totally occluded LCx with an anomalous origin.
2. Case presentation

A 66 year-old female patient with a familiarity for coronary artery disease, dyslipidemia, and previous right carotid endo-carotidectomy was admitted at our hospital for an recurrent episode of angina at rest. A treadmill exercise testing showed ST-segment depression in the anterolateral leads at a workload of 75 W. Transthoracic echocardiography was unremarkable.

Left coronary artery angiography allowed to visualize only the left anterior descending coronary artery (LAD) showing a 50% stenosis at its mid segment (46% diameter stenosis at QCA on-line analysis, GE Medical Systems) and a 75% stenosis of a small sized diagonal branch (Fig. 1, panel A). Caudal view showed collaterals for LCx (Fig. 1, panel B) which was not visualized antegrade in the left coronary sinus even after unselective contrast injection. Selective angiography of the right coronary artery (RCA) revealed a severely diffused atheroma and sub-occlusion in the mid portion of the vessel (Fig. 1, panel C). The selection of an Amplatz Right 2 catheter allowed to selectively engage an anomalously arising LCx, which shared its origin with RCA, thus revealing a chronic total occlusion in its proximal segment (Fig. 1, panel D). Functional evaluation of mid LAD lesion with pressure wire revealed a fractional flow reserve value of 0.86 during the administration of intravenous adenosine at 140 μg/kg/min. The option of surgical revascularization was thus ruled out and we decided to attempt percutaneous revascularization of both LCx and RCA.

The right coronary ostium was engaged with an Amplatz Right 2 (Zuma 2, Medtronic) guiding catheter. The multiple stenoses of the RCA were crossed with a 0.014 in. hydrophilic guidewire (Pilot 150, Abbott). Multiple dilatations with increasing diameter balloons (maximum diameter 2.0 × 20 mm at 12 atm) were performed in the mid-RCA. Control angiogram showed a spiral type E coronary dissection extended to the posterior descending artery (PDA). Four overlapping everolimus eluting stents (2.5 × 12 mm, 2.5 × 23 mm, 2.5 × 33 mm and 2.75 × 15 mm Xience V, Abbott), were implanted at 16 atm in mid and distal RCA and distal RCA–PDA segment, with complete coverage of the dissection and final TIMI 3 antegrade flow (Fig. 2).

The total occlusion of anomalously originating LCx was successfully crossed with a 0.014 in. hydrophilic wire (Fielder, ASAHI). Multiple dilatations with increasing diameter balloons (max. 2.0 × 25 mm at 18 atm) were performed in the proximal part of the vessel, obtaining its antegrade recanalization (Fig. 3, panel A). Two overlapping zotarolimus eluting stents (2.5 × 30 mm and 2.5 × 24 mm, Resolute Integrity, Medtronic) were then implanted at 15 and 16 atm in the proximal part LCx.

![Fig. 1 – Left and right coronary angiography.](image-url) Panel A. Coronary angiography revealed an angiographically moderate mid LAD and severe second diagonal branch stenoses. Panel B. Caudal view demonstrating late dye filling of the anomalous LCx through left coronary collaterals. Panel C. RCA selective angiography performed with JR4 6F showed multiple critical stenoses on mid portion. Panel D. Switching to Amplatz AR 2 mode allowed demonstrating a shared origin of anomalous circumflex with RCA and a tapered total occlusion in the proximal portion of the anomalous LCx.
with a residual subtotal stenosis of a small diameter marginal branch (Fig. 3, panel B). A 2.25 × 15 mm everolimus eluting stent (Xience V, Abbott) was finally deployed at 14 atm in the marginal branch. Final angiograms showed good angiographic result and TIMI 3 antegrade flow (Fig. 3, panel C). Four months later, coronary angiographic control showed patency of the stents deployed in RCA and in the anomalous LCx.

### 3. Discussion

PCI to anomalous coronary arteries represents technical difficulties. Major determinants of procedural success are angiographic knowledge of their course and the appropriate selection of guiding catheter/wire, which represent the main factors to provide adequate the stability and coaxiality of the guiding catheter.

The peculiarity of the case here presented consists in the presence of a chronic total occlusion (CTO) localized in an LCx originating from the right sinus of Valsalva. To the best of our knowledge this is the first case presented of successful recanalization of a CTO in an anomalously arising LCx. As suggested by some authors, PCI might be the revascularization of choice for such cases given their relatively small caliber and inaccessible location for surgical grafting [9,10].

Judkins or Amplatz right catheters are reported to provide stable guiding catheter positions for interventions in anomalous LCx, especially in type II and III anatomy. Initially Judkins right catheter used to engage RCA did not allow to visualize the anomalous origin of LCx. Switching to AR-shaped guide catheter allowed to engage the ostium of the anomalous circumflex after increased balloon diameter dilatations. Panel B. Angiogram after the 2 DES deployment in proximal segment of anomalous LCx and the subtotal occlusion of the marginal branch. Panel C. Final angiogram after DES deployment in marginal branch. Complete revascularization of the anomalous circumflex and TIMI 3 antegrade flow is demonstrated.

Fig. 2 – PCI to RCA. Final result after implantation of 4 DES.

Fig. 3 – PCI to LCx. Panel A. Angiogram showing recanalization of the anomalous circumflex after increased balloon diameter dilatations. Panel B. Angiogram after the 2 DES deployment in proximal segment of anomalous LCx and the subtotal occlusion of the marginal branch. Panel C. Final angiogram after DES deployment in marginal branch. Complete revascularization of the anomalous circumflex and TIMI 3 antegrade flow is demonstrated.
LCx revealing the shared origin with RCA (type II) anatomical variation origin according to West et al. definition (8). We felt that the Amplatz shape was adequate to provide maximal support for PCI to anomalous LCx and RCA. Given the tapered shape and probable micro-channels that are usually associated with this type of occlusions, we chose a hydrophilic first line CTO wire (Fielder ASAHI) and tried antegrade recanalization with the intention of the step-up technique. The choice of DES was then based not just on the well-known DES superiority over BMS in CTOs [11], but also on the basis of the small caliber of the vessel, the length of the occlusion and the probable retro-aortic course.

4. Conclusion

Despite the overall low prevalence of anomalous coronary arteries, interventional cardiologists might encounter unusual cases such as the one here reported. The knowledge of the anatomy and the appropriate selection of the guiding catheters/wires, balloons and stents allows achieving a successful result even in such unusual presentations.

References


