CASE REPORT

Secondary Percutaneous Revascularization for Severe Unprotected Left Main Disease After Surgical Turndown

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Abstract

Patients with severe left main and/or multi-vessel coronary artery disease (CAD) and contraindications or extremely high risk for surgical revascularization that are subsequently referred for percutaneous coronary intervention (PCI) have been increasing in clinical practice. We present the case of a patient with a previous history of aortic valve replacement and coronary artery bypass grafting (CABG) hospitalized because of angina recurrence and a functional test with myocardial scintigraphy that showed extensive myocardial ischemia. The coronary angiogram revealed severe left main and two-vessel disease with totally occluded bypass grafts, while revascularization by re-do CABG was rejected. The patient was finally treated by a technically challenging high-risk unprotected left main PCI. ***Rhythmos 2017;12(2):29-32.***

Key Words: secondary revascularization, left main disease, percutaneous coronary intervention

Abbreviations: CABG = coronary artery bypass grafting; CAD = coronary artery disease; LAD = left anterior descending; PCI = percutaneous coronary intervention

Introduction

Over the last several years patients with severe left main and/or multi-vessel coronary artery disease (CAD) treated with percutaneous coronary interventions (PCI) instead of coronary artery bypass grafting (CABG) have been increasing in numbers. This is due to the fact that the average age and comorbidities burden of patients referred for revascularization has been increasing and thus scenarios of patients with advanced CAD referred for complex PCI after surgical turndown may be frequently encountered by the Heart Team. Among them a special category are patients with previous CABG that are referred for secondary revascularization with PCI.[1] Meanwhile the improvement of techniques, adjunctive technologies and pharmacotherapy have made complex PCI a mostly reproducible, effective and safe treatment with acceptably low complications rate.[2]

We herein present the case of a patient with a previous history of aortic valve replacement and CABG admitted because of debilitating angina recurrence attributed to severe left main and two-vessel disease along with totally occluded bypass grafts. After an unsurprising surgical turndown during the Heart Team meeting the patient was finally treated with PCI.

Case presentation

A 64-year-old patient was admitted to our department for unstable angina immediately after a strongly positive stress test coupled with myocardial scintigraphy imaging which showed extensive antero-lateral ischemia. He had a history of a severely stenotic bicuspid aortic valve replacement with a mechanical one (St Jude 25 mm) and also CABG with two saphenous vein grafts to the LAD and marginal branch both performed 20 years ago. His risk factor profile consisted of active smoking, arterial hypertension and dyslipidemia. Furthermore, he had a history of non-Hodgkin lymphoma treated with chemotherapy and chest radiotherapy 19 years earlier. His actual treatment consisted of aspirin 100 mg/d, acenocoumarol with target INR around 2.5-3.0, an ACE inhibitor, a β-blocker and a statin. Concerning his initial diagnostic workup, all parameters of his initial blood tests were within normal limits, his INR was 2.4 and echocardiography revealed a preserved ejection fraction without segmental left ventricular wall motion abnormalities and a well-functioning mechanical bileaflet aortic valve without any other abnormal findings.

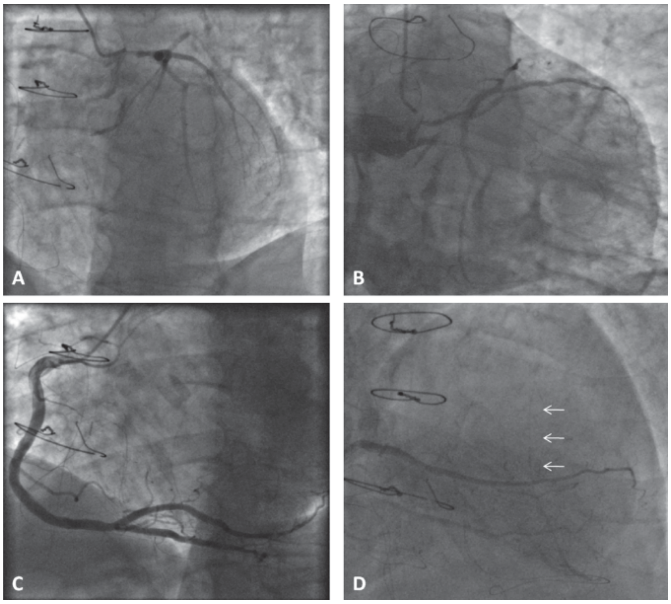

Figure 1. Diagnostic coronary angiography (right radial approach) **A.** LAO cranial view: Severe diffuse disease of the left main (which trifurcates distally) is demonstrated. **B.** LAO caudal view: The diffusely and severely narrowed left main is shown. It trifurcates into an LAD with a chronic total occlusion at its mid segment after supplying a significant 1st diagonal branch, a moderately sized ramus intermedius and a circumflex artery with a chronic total occlusion of a moderately sized marginal branch. **C.** A dominant right coronary artery without significant disease. **D.** At the end of the right coronary artery contrast injection, retrograde late filling is noted of the distal LAD which is diffusely diseased and filiform.

Coronary angiography was performed the day following admission from the right radial approach and revealed very severe diffuse left main disease (80-90% stenosis, with pressure damping when the diagnostic catheter touched the ostium), chronic total occlusion of the LAD after the origin of a very significant first diagonal branch, moderate stenosis of a moderately sized ramus intermedius, chronic total occlusion of a moderately sized marginal branch and a dominant right coronary artery without any stenosis that provided retrograde filling to a diffusely infiltrated and filiform distal part of the LAD (**Fig.** 1). The two saphenous vein grafts were occluded, while the left internal mammary artery had not been used during the initial CABG operation because of poor quality. At the Heart Team meeting the option of re-do CABG was promptly rejected due to the previous sternotomy and chest radiotherapy, while the distal LAD was considered unsuitable for grafting. Therefore, percutaneous revascularization with a high risk unprotected left main PCI procedure was decided.

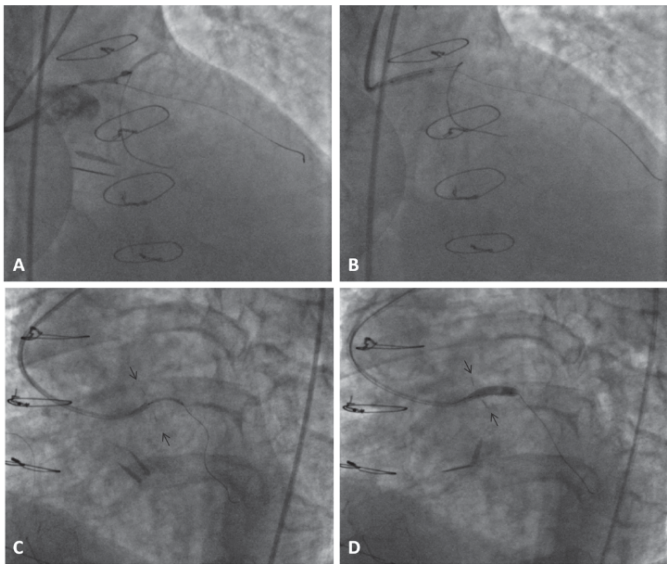

Figure 2. Procedural steps of unprotected left main PCI (right femoral approach). **A.** A JL4 guiding catheter was positioned just in front of the severely stenotic ostium of the left main to avoid pressure damping. Two guidewires were cautiously advanced distally into the large 1st diagonal and the circumflex artery. The positioning of the first 2.5x15mm non-compliant balloon in the left main can be seen and it can be appreciated that it was partially occlusive for the left coronary system. It was inflated at 16 Atm for 10 sec in order to start lesion preparation for stenting. **B.** Two subsequent pre-dilatations of the quite resistant left main lesion followed. Initially with a 3x15mm scoring balloon at 14 Atm for 10 seconds (Angiosculpt, Angioscore) and finally with a 3.5x15mm non-compliant balloon at 20 Atm for 10 seconds. **C.** Positioning of a 3.5x18mm biodegradable polymer drug-eluting stent (Orsiro, Biotronik) in order to cover the left main from the ostium at its distal part. To secure accurate positioning of the stent an Ostial pro device (Merit Medical) was used. At the LAO cranial view two of its four nitinol legs (black arrows) just outside the guiding catheter tip form a line that shows the plane of the left main ostium. This was the target to deploy the proximal stent edge in order not to miss the left main ostium. **D.** The stent deployment is shown (at 16 Atm for 10 sec) and the two of the four Ostial pro legs that are 180º apart and form a line at the level of the left main ostium can be appreciated (black arrows). The left main stent was finally post-dilated with a 4x15mm non-compliant balloon at 20 Atm for 10 seconds (not shown).

The intervention was performed from the right femoral approach and a JL4 guiding catheter was positioned initially just in front of the severely narrowed left main ostium to avoid pressure damping. Two guidewires were advanced distally into the large 1st diagonal branch and the circumflex artery. The severe diffuse left main lesion was resistant and thus had to be pre-dilated sequentially with a 2.5x15mm non-compliant balloon, a 3x15mm scoring balloon and a 3.5x15mm non-compliant balloon at high pressure (up to 20 Atm) (Figure 2, A and B). After verifying that the lesion was adequately prepared it was decided to implant a 3.5x18mm drug-eluting stent with biodegradable polymer (Orsiro, Biotronik) which would suffice to cover the ostium and the entire length of the left main, according to measurements made with the 15mm long balloons used for pre-dilatation. In order to maximize implantation precision and avoid interfering with the distal left main trifurcation (no ostial disease of the left anterior descending, the ramus intermedius or the circumflex was noted) we decided to use a device specifically designed for accurate placement of stents to treat aorto-ostial lesions (Ostial Pro, Merit Medical).[3] This is a relatively simple device that is positioned within the guiding catheter and has four distal, self-expanding nitinol legs that are advanced just distal to the tip of the guiding catheter after the ostial lesion has been crossed with the coronary guidewire and stent. The expanded legs prevent the entry of the guiding catheter into the target vessel, mark the plane of the aortic wall, and align the tip of the guiding catheter with the aorto-ostial plane.[4] Thus the proximal edge of the stent was positioned exactly at the left main ostium which was not missed, while the total length of the left main was stented without extending distally into its trifurcation (Fig. 2, C and D). The stent was inflated at 16 Atm for 10 seconds and post-dilated with a 4x15mm non-compliant balloon at 20 Atm for 10 seconds. The final angiographic result was optimal (Fig. 3).

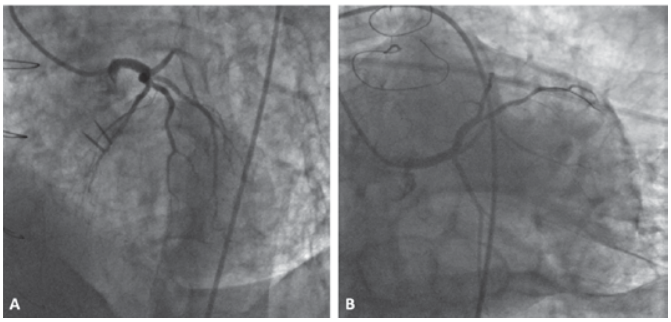

Figure 3. Optimal final angiographic result. **A.** LAO cranial view, **B.** LAO caudal view.

The patient became symptom free and was discharged 48 hours later in good functional status and without complications. Triple therapy with aspirin 100 mg/d, clopidogrel 75mg/d and acenocumarol with target INR 2.5 was continued for 3 months and clopidogrel was stopped thereafter. Otherwise the patient continued to be treated with optimal medical therapy (ACE inhibitor, β-blocker and high-dose statin). A stress test coupled with myocardial scintigraphy 6 months later showed no myocardial ischemia. The patient remains without symptoms and in good functional status 2 years after the procedure.

Discussion

We described the case example of a patient operated 20 years ago for aortic valve replacement and CABG with angina recurrence due to severe diffuse left main disease and occluded saphenous vein grafts. Being a poor candidate for a second surgical revascularization for the reasons mentioned above he had to be submitted to a secondary revascularization procedure which was a technically challenging unprotected left main PCI.

The possibility that any given patient with CAD will require more than one coronary interventions has significantly increased during the last two decades. The ageing of the population increases the absolute number of patients with CAD but also the possibility of disease progression or surgical graft failure among those with previous CABG. The age of the initial revascularization procedure is a significant factor thus younger patients are more likely than older ones to have to undergo repeat interventions.[5] Patients demanding secondary revascularization are also more likely to present more severe CAD as a result of the time elapsed since the initial revascularization procedure, leaving fewer options and augmenting the complexity of further re-interventions.[1] There has been a shift in practice regarding the modality of revascularization in patients with previous CABG during the last decades. Re-do CABG was dominant throughout the eighties, it was subsequently followed by more conservative approaches with decrease of surgical re-interventions and was finally superseded by crossed revascularization with PCI.[1,6] Currently only 3% of patients with prior CABG undergo re-do CABG.[7] Our patient was treated according to the 2014 ESC revascularization guidelines which in patients with previous CABG recommend PCI as the first choice for repeat revascularization if technically feasible rather than re-do CABG (class IIa, level of evidence C).[2]

Technical improvements and the development of drug-eluting stents led to greater use of PCI for unprotected left main disease and to multiple comparisons between the two competing revascularization modalities (i.e., PCI with drug-eluting stents versus CABG) in randomized trials as well as in large registry studies. [8] According to the SYNTAX trial results both provided similar results with respect to the composite end-point of death, myocardial infarction, stroke, or unplanned ischemia-driven revascularization. Stroke occurred more frequently in the CABG group than in the PCI group, whereas the need for repeat revascularization was greater in the PCI group than in the CABG group.[9] As a consequence, PCI with drug-eluting stents is being used with increasing frequency, currently exceeding the frequency of CABG in several centers.[10,11] In the 2014 ESC revascularization guidelines left main PCI holds a class I (level of evidence B) recommendation when SYNTAX score is ≤22, a class IIa (level of evidence B) recommendation when SYNTAX score is 22-32 and is not recommended when SYNTAX score is >32 (class III, level of evidence B).[2] The recently published EXCEL study further supports left main PCI since it has demonstrated that in patients with left main disease and SYNTAX scores ≤32 PCI with everolimus-eluting stents was non-inferior to CABG with respect to the rate of the composite end point of death, stroke, or myocardial infarction at 3 years.[12]

In our patient, unprotected left main PCI was the only option for revascularization, while the diffuse severe disease from the ostium until the end of a trifurcating left main stem rendered the intervention technically challenging. To overcome the difficulties, it was decided to use tools that are representative of recent advances in percutaneous intervention techniques. Firstly, a scoring balloon was used among others to sufficiently prepare a chronic, quite resistant, fibrotic left main lesion before stenting.[13] Secondly, according to recent guidelines the lesion was treated with a last generation biodegradable polymer drug-eluting stent that allows to keep minimal the duration of dual antiplatelet therapy for a patient with a mechanical valve and thus obligatory permanent anticoagulation treatment.[2] Finally, in order to cover the entire left main length from the ostium at its distal end with

a well sized stent without interfering with its trifurcation (and thus adding further complexity to the PCI procedure) a device that maximizes accuracy of stent placement to treat aorto-ostial lesions was used.[4] Therefore the presented case can be considered as an example of how continuous progress regarding PCI tools and techniques contributes to safer interventions, procedural success and positive clinical outcomes even in complex cases.

REFERENCES

1. Brener SJ, Lytle BW, Casserly IP, Ellis SG, Topol EJ, Lauer MS. Predictors of revascularization method and long-term outcome of percutaneous coronary intervention or repeat coronary bypass surgery in patients with multivessel coronary disease and previous coronary bypass surgery. ***Eur Heart J*** 2006;27:413-418.
2. Windecker S, Kolh P, Alfonso F, et al. 2014 ESC/EACTS Guidelines on myocardial revascularization: The Task Force on Myocardial Revascularization of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)Developed with the special contribution of the European Association of Percutaneous Cardiovascular Interventions (EAPCI). ***Eur Heart J*** 2014;35:2541-2619.
3. Fischell TA, Malhotra S, Khan S. A new ostial stent positioning system (Ostial Pro) for the accurate placement of stents to treat aorto-ostial lesions. ***Catheter Cardiovasc Interv*** 2008;71:353-357.
4. Fischell TA, Saltiel FS, Foster MT, Wong SC, Dishman DA, Moses J. Initial clinical experience using an ostial stent positioning system (Ostial Pro) for the accurate placement of stents in the treatment of coronary aorto-ostial lesions. ***J Invasive Cardiol*** 2009;21:53-59.
5. Sabik JF, 3rd, Blackstone EH, Gillinov AM, Smedira NG, Lytle BW. Occurrence and risk factors for reintervention after coronary artery bypass grafting. ***Circulation*** 2006;114:I454-460.
6. Tatoulis J, Buxton BF, Fuller JA. Patencies of 2127 arterial to coronary conduits over 15 years. ***Ann Thorac Surg*** 2004;77:93-101.
7. Yap CH, Sposato L, Akowuah E, et al. Contemporary results show repeat coronary artery bypass grafting remains a risk factor for operative mortality. ***Ann Thorac Surg*** 2009;87:1386-1391.
8. Athappan G, Patvardhan E, Tuzcu ME, Ellis S, Whitlow P, Kapadia SR. Left main coronary artery stenosis: a meta-analysis of drug-eluting stents versus coronary artery bypass grafting. ***JACC Cardiovasc Interv*** 2013;6:1219-1230.
9. Morice MC, Serruys PW, Kappetein AP, et al. Five-year outcomes in patients with left main disease treated with either percutaneous coronary intervention or coronary artery bypass grafting in the synergy between percutaneous coronary intervention with taxus and cardiac surgery trial. ***Circulation*** 2014;129:2388-2394.
10. Park SJ, Ahn JM, Kim YH, et al. Temporal trends in revascularization strategy and outcomes in left main coronary artery stenosis: data from the ASAN Medical Center-Left MAIN Revascularization registry. ***Circ Cardiovasc Interv*** 2015;8:e001846.
11. Lee PH, Ahn JM, Chang M, et al. Left Main Coronary Artery Disease: Secular Trends in Patient Characteristics, Treatments, and Outcomes. ***J Am Coll Cardiol*** 2016;68:1233-1246.
12. Stone GW, Sabik JF, Serruys PW, et al. Everolimus-Eluting Stents or Bypass Surgery for Left Main Coronary Artery Disease. ***N Engl J Med*** 2016;375:2223-2235.
13. Schmidt T, Hansen S, Meincke F, Frerker C, Kuck KH, Bergmann MW. Safety and efficacy of lesion preparation with the AngioSculpt Scoring Balloon in left main interventions: the ALSTER Left Main registry. ***EuroIntervention*** 2016;11:1346-1354.