

A 55-year-old man with a history of type 2 diabetes mellitus, hypertension, dyslipidemia, previous ischemic stroke, and tripple-vessel coronary artery disease treated with right coronary artery (RCA) and left anterior descending artery (LAD) percutaneous coronary intervention (PCI) six years earlier presented with persistent retrosternal chest pain for 48 hours. At presentation, the chest discomfort remained ongoing with a pain score of 4/10. He was hemodynamically stable. Physical examination revealed fine bibasal crepitations without evidence of cardiogenic shock. Twelve-lead electrocardiography demonstrated normal sinus rhythm with pathological Q waves and persistent ST-segment elevation in leads II, III, and aVF. Transthoracic echocardiography showed dilated cardiomyopathy with severely impaired left ventricular systolic function (LVEF 32%), akinesia involving the inferior and posterior walls from the basal to apical segments, grade I diastolic dysfunction with normal left ventricular filling pressure, structurally normal cardiac valves, and no pericardial effusion.

Emergency coronary angiography demonstrated patent left anterior descending artery stents, chronic total occlusion of the proximal left circumflex artery, and a horizontal RCA with diffuse distal RCA in-stent restenosis, severe posterior descending artery (PDA) disease, and total occlusion of the posterolateral (PL) branch.

PCI was performed via right radial access using a JR 4 guiding catheter. A Sion guidewire was successfully advanced into the PDA; however, multiple attempts to wire the PL branch with Runthrough and Fielder XT guidewires supported by a Finecross microcatheter were unsuccessful. Consequently, the revascularization strategy was modified to focus on PCI of the distal RCA extending into the PDA. Following sequential predilatation of the distal RCA and PDA, a 3.5 × 33 mm Xience ProA drug-eluting stent was implanted across the distal RCA. Because the distal PDA appeared to be a small-caliber vessel by angiographic assessment, a 2.5 × 40 mm Magic Touch drug-coated balloon (DCB) was selected for treatment of the distal lesion. Following DCB angioplasty of the PDA and before any post-dilatation with a non-compliant balloon, the jailed Runthrough guidewire could not be retrieved despite steady traction. Multiple bailout techniques were attempted, including advancing a microcatheter to support wire retrieval and deep intubation with a guide extension catheter. However, the guidewire progressively unraveled under constant traction and eventually fractured. The radiopaque distal segment remained entrapped beneath the distal RCA stent with extension into the chronically occluded PL branch. The proximal non-radiopaque core elongated markedly before separation, precluding the microcatheter from reaching the fracture site. Final angiography demonstrated preserved TIMI 3 flow without dissection or visible retained wire within the main RCA, although the overall procedural result was considered suboptimal because of the retained guidewire fragment.

Given the presence of retained guidewire fragments and concern regarding stent optimization, a staged re-intervention was performed three days later via right femoral access. Intravascular ultrasound (IVUS) demonstrated diffuse, circumferential (360°) fibrocalcific atherosclerotic plaque throughout the RCA, with marked positive remodeling and reference vessel diameters of 3.5 mm at the PDA, 5.0 mm at the distal RCA, 6.0 mm at the mid RCA, and 6.5 mm at the proximal RCA. The previously implanted distal RCA stent was markedly undersized and malapposed ("floating") without evidence of intraluminal thrombus. A disrupted guidewire fragment was identified trapped beneath the distal RCA stent struts. In addition, a protruding calcium nodule was observed in the distal PDA with adjacent circumferential (360°) deep calcium, indicating severe calcific plaque burden extending into the distal vessel.

Extensive lesion preparation was performed using sequential high-pressure non-compliant balloons and a Wolverine cutting balloon, resulting in satisfactory calcium fracture confirmed by IVUS. Two overlapping Onyx TruCor drug-eluting stents (3.5 × 38 mm and 3.5 × 30 mm) were subsequently implanted from the distal RCA to the PDA, followed by aggressive high-pressure post-dilatation using appropriately sized non-compliant balloons. Final IVUS confirmed satisfactory stent expansion without edge dissection, achieving a minimal stent area of 8.28 mm² in the distal RCA and 11.52 mm² proximally, with restoration of TIMI 3 flow and an uneventful clinical recovery.

Discussion

This case highlights two important procedural lessons in contemporary complex coronary intervention.

First, guidewire entrapment and fracture may occur when implanting a stent across a jailed side branch in heavily calcified bifurcation lesions. In retrospect, the side-branch guidewire had already developed significant angulation after repeated balloon dilatation and lesion modification. Implantation of the stent across the markedly angulated jailed guidewire likely increased friction between the wire, stent struts, and heavily calcified plaque, preventing successful wire retrieval and ultimately resulting in guidewire fracture. Careful fluoroscopic assessment of jailed guidewire geometry before stent deployment is therefore essential. When excessive wire angulation or deformation is observed, operators should consider rewiring, removing the jailed wire before stenting when feasible, or modifying the procedural strategy to minimize the risk of guidewire entrapment.

Second, angiographic estimation alone may substantially underestimate vessel diameter, particularly in diffusely diseased distal vessels with positive remodeling or heavy calcification. In this case, the distal PDA initially appeared to be a small vessel and was therefore treated with a drug-coated balloon. However, subsequent IVUS demonstrated a significantly larger true vessel diameter (approximately 3.5 mm) with extensive fibrocalcific plaque burden, indicating that the lesion was more suitable for drug-eluting stent implantation after adequate calcium modification rather than DCB therapy alone. This case underscores the pivotal role of intravascular imaging in optimizing lesion assessment, vessel sizing, and treatment selection, particularly when DCB therapy is contemplated in distal or apparently small coronary vessels.

Learning Points

In heavily calcified bifurcation lesions, operators should carefully inspect the configuration of the jailed side-branch guidewire before stent deployment. A markedly angulated or kinked wire following balloon dilatation may become entrapped beneath the stent struts, increasing the risk of guidewire fracture during retrieval.

Drug-coated balloon treatment in distal or apparently small coronary vessels should ideally be guided by intravascular imaging. IVUS frequently reveals a larger true vessel size than angiographic estimation alone, allowing more appropriate selection between DCB and drug-eluting stent implantation while optimizing long-term procedural outcomes.