

Crossing and Bifurcation ReconstructionKiran Lakkireddy¹¹ Cardiology, Apollo Hospitals, India

A 50-year-old woman with diabetes mellitus, hypertension, chronic heart failure, and severe ischemic cardiomyopathy presented with progressive exertional dyspnea despite optimal medical therapy. Coronary angiography demonstrated chronic total occlusion (CTO) of the left anterior descending artery (LAD) associated with complete in-stent restenosis of a previously treated diagonal ostium. The diagonal branch filled through contralateral collaterals, while the distal LAD filled via ipsilateral collateral circulation. Cardiac MRI confirmed preserved myocardial viability within the LAD territory, supporting revascularization.

The lesion represented a challenging CTO (J-CTO score 2) with a blunt proximal cap, vessel tortuosity, ambiguous distal cap, and bifurcation involvement. The principal challenge was identification of the true LAD course after prior diagonal ostial stenting, where angiography alone was insufficient to define the vessel architecture.

An antegrade wire-escalation strategy was adopted. Careful exploration with a polymer-jacketed guidewire through a microcatheter identified a small residual microchannel that enabled controlled advancement into the diagonal branch before successful redirection into the distal true LAD lumen. Repeated dual angiographic injections through both the guiding catheter and the microcatheter confirmed true lumen position and prevented inadvertent subintimal tracking.

Following sequential balloon dilatation, intravascular ultrasound (IVUS) demonstrated fibrocalcific plaque progression and plaque shift from the previously implanted diagonal stent, explaining the mechanism of LAD CTO. IVUS further defined vessel dimensions, plaque morphology, bifurcation anatomy, and optimal landing zones, allowing precise procedural planning.

The LAD was reconstructed using sequential drug-eluting stent implantation across the diagonal bifurcation. The diagonal branch was subsequently rewired through the stent struts, followed by kissing balloon inflation and proximal optimization technique. Final IVUS demonstrated excellent stent expansion, complete apposition, preserved bifurcation geometry, and absence of edge complications. Final angiography showed TIMI III flow in both the LAD and diagonal with an excellent procedural result.

Learning Objectives:

This case illustrates an uncommon mechanism of LAD CTO developing after previous diagonal ostial stenting secondary to fibrocalcific plaque shift and disease progression. It highlights the complementary role of myocardial viability assessment, dual-injection angiography, microcatheter-guided antegrade crossing, and IVUS-guided bifurcation PCI in safely treating complex CTO anatomy. Imaging-guided procedural planning and optimization were fundamental to achieving complete revascularization while preserving both branches in a complex bifurcation CTO.