

## Successful Bailout of Caravel Microcatheter Tip Fracture During IVUS-Guided Retrograde CTO PCI for a Severely Calcified Left Anterior Descending Artery Chronic Total Occlusion

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### Background

Retrograde chronic total occlusion (CTO) percutaneous coronary intervention (PCI) for severely calcified lesions remains technically challenging and is occasionally complicated by device-related failure. Microcatheter tip fracture is an extremely rare complication, and effective bailout strategies have seldom been described.

### Case Summary

A man in his 70s underwent elective PCI for a severely calcified chronic total occlusion of the left anterior descending artery (LAD). The antegrade approach was performed via the right femoral artery using an 8-Fr SPB 3.75 guiding catheter, whereas the retrograde approach was performed via the left radial artery using a 7-Fr AL1.0 guiding catheter. Coronary angiography demonstrated a blunt proximal cap with distal bifurcation, while preprocedural coronary computed tomography revealed nearly circumferential ("full-moon") calcification at the distal CTO cap.

An IVUS-guided antegrade puncture strategy was initially attempted by advancing an IVUS catheter into a septal branch to visualize the proximal cap. However, repeated prolapse of the IVUS catheter into the LAD prevented stable imaging, and the antegrade strategy was abandoned.

A retrograde approach was subsequently performed through the fourth posterior descending septal collateral using a Sion guidewire and SUOH 03, successfully crossing the collateral channel. The distal CTO cap was penetrated with a Gladius guidewire and advanced into the proximal LAD. Because the antegrade IVUS catheter remained positioned across the lesion, real-time IVUS confirmed that the retrograde guidewire remained within the true lumen, allowing successful guide catheter engagement (chip-in).

Attempts to advance a Caravel microcatheter across the heavily calcified lesion using balloon trapping were unsuccessful. Therefore, an antegrade Corsair Pro microcatheter was advanced to perform a microcatheter kissing technique. At that time, fracture of the distal Caravel tip was recognized. The fractured tip remained on the retrograde Gladius guidewire and became entangled with the antegrade Corsair Pro. Retrieval of the fractured tip together with the Corsair Pro was attempted; however, during withdrawal, the Caravel tip detached and remained inside the antegrade guiding catheter.

A snare catheter was immediately introduced through the antegrade guiding catheter. The retained Caravel tip was successfully captured while remaining on the retrograde Gladius guidewire and was completely retrieved without distal embolization. During retrieval of the fractured tip with the snare, the Caravel microcatheter unexpectedly crossed the severely calcified CTO segment. Subsequent advancement of the Corsair Pro produced an effective bougie effect, allowing successful passage of a soft guidewire into the distal LAD. IVUS confirmed that the guidewire traversed the center of the circumferential distal cap calcification. Rotational atherectomy using a 2.0-mm burr was subsequently performed, followed by balloon angioplasty and implantation of a drug-eluting stent. Final angiography demonstrated an excellent result with TIMI 3 flow.

### Conclusion

This case demonstrates successful bailout of an exceptionally rare Caravel microcatheter tip fracture during retrograde CTO PCI. The fracture was presumed to have resulted from excessive torsional stress generated while forcefully advancing the Corsair Pro against severe circumferential calcification, leading to shearing of the Caravel tip. Prompt recognition of the complication, IVUS-guided assessment, and timely snare retrieval enabled safe continuation of the procedure and successful completion of PCI. This case provides important insight into both the mechanism of microcatheter tip fracture and an effective bailout strategy during complex retrograde CTO intervention.