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# Controlled antegrade intimal tracking with subintimal balloon inflation as a novel bailout technique for chronic total occlusion after failed intravascular ultrasound-guided parallel wire technique☆

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ABSTRACT

Failure to cross with a guidewire is the most common reason for failure of chronic total occlusion (CTO) percutaneous coronary intervention (PCI). In cases of CTO PCI with no interventional collaterals, an intravascular ultrasound (IVUS)-guided parallel wire technique is usually the last-resort procedure. Failure of this technique sometimes causes enlarged subintimal space, resulting in procedure failure. We present a successful second attempt at left anterior descending artery CTO PCI with no interventional collaterals. After IVUS-guided parallel wire technique failed with an enlarged subintimal space, successful antegrade wire crossing was achieved using controlled antegrade intimal tracking with balloon inflation in the subintimal space to deflect a second wire. This technique may be useful as a bailout strategy in otherwise-failed CTO PCI with an enlarged subintimal space.



## 1. Introduction

In recent reports, a retrograde approach was shown to improve success rates in percutaneous coronary intervention (PCI) of chronic total occlusion (CTO) [1,2]. However, retrograde collateral crossing fails in about 20% of CTO cases [2,3]. When retrograde approach and re-entry devices are not available and angiographic-guided parallel wire technique fails, intravascular ultrasound (IVUS)-guided parallel wire technique is usually the last-resort procedure. If the subintimal space has already greatly expanded, crossing to the true lumen is very difficult, even with the IVUS-guided parallel wire technique. We describe a case of a second attempt at PCI for the left anterior descending artery (LAD) CTO with no accessible retrograde channel. Successful guidewire crossing was achieved using controlled antegrade intimal tracking with subintimal balloon inflation after failed IVUS-guided parallel wire technique.

## 2. Case report

An 85-year-old woman with hypertension, diabetes mellitus and dyslipidemia underwent PCI for CTO of the LAD in 2015. The PCI failed secondary to guidewire-induced coronary perforation. Approximately 6 months later, we performed a second attempt at PCI for the LAD CTO with a bi-femoral approach. An 8-Fr Hyperion JL4.0 guiding catheter (GC) (ASAHI Intecc, Aichi, Japan) with a side hole was engaged into the left coronary artery and a 5-Fr diagnostic catheter was engaged into the right coronary artery (RCA) for contralateral injection. Control angiography showed ostial LAD CTO with poor collateral flow, which caused poor visualization of the distal vessel (Fig. 1A, B). We introduced a floppy guidewire (GW) (SION, ASAHI Intecc) into the first descending septal artery branch just before the CTO and checked the ostium of the CTO with intravascular ultrasound (IVUS) (Navifocus WR, Terumo, Tokyo, Japan). We inflated a small balloon (Euphora, 1.5 × 15 mm, Medtronic, Minneapolis, MN, USA) at the septal branch for the anchor balloon technique. We delivered a Crusade double-lumen microcatheter (MC) (Kaneka Medix, Osaka, Japan) along the floppy GW to the proximal LAD and advanced a tapered tip GW (XT-A, ASAHI Intecc) via the side hole of the Crusade catheter. The XT-A GW was advanced to the midpoint of the CTO. However, we could not advance the XT-A GW any further. We exchanged the MC from the Crusade to a Corsair MC (ASAHI Intecc) and advanced this MC into the CTO. Then, we exchanged the GW from the XT-A to a Gaia Second GW (ASAHI Intecc) and advanced the GW to the distal CTO with bending and severe calcification. Contralateral injection did not show the distal true lumen (Fig. 1C). We tried to confirm the location of the GW using IVUS. After we dilated the proximal CTO with the small balloon (Euphora, 1.5 × 15 mm), we inserted the IVUS there. The IVUS showed that the GW was in the subintimal space from the proximal CTO (Fig. 2A). Then, we performed an IVUS-

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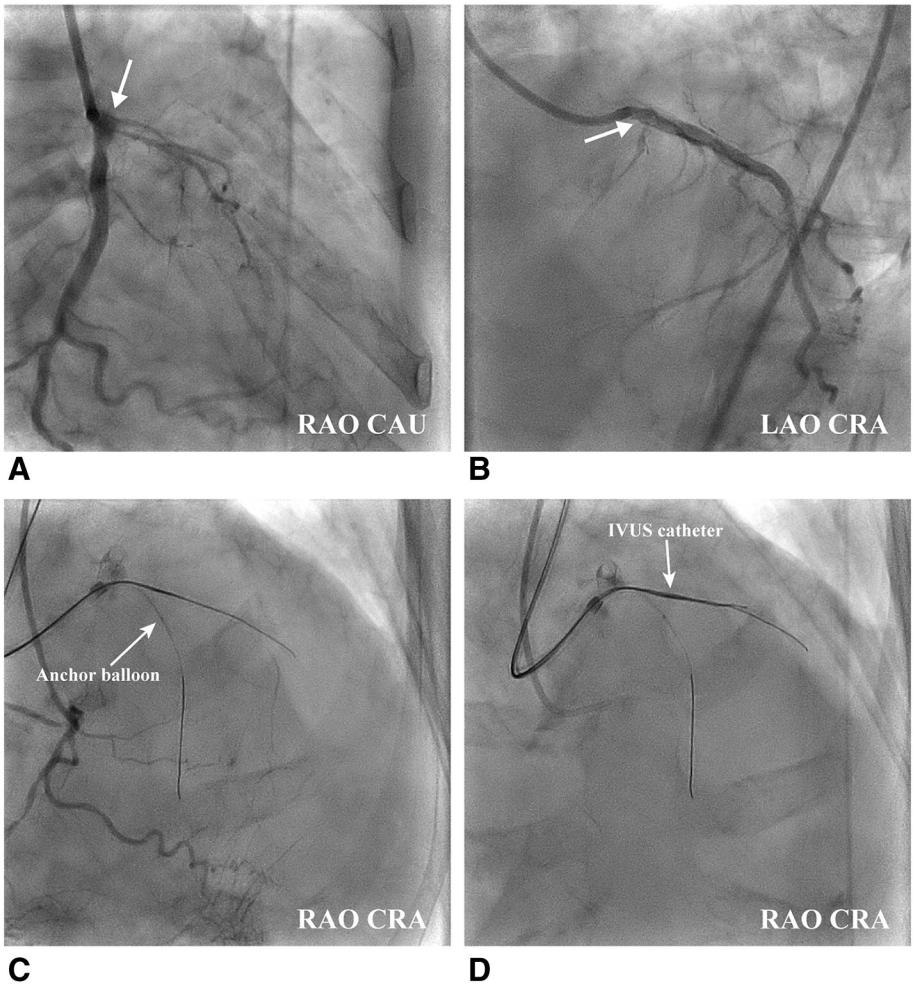


**Fig. 1.** A, B: Control coronary angiography of the left coronary artery. LAD was totally occluded from the ostium. White arrow-heads indicate the entrance of the LAD CTO. C: Contralateral injection via the right coronary artery could not visualize the distal vessel of the LAD CTO very well. D: IVUS-guided parallel wire technique.

guided parallel wire technique (Fig. 1D). We could not cross a Gaia third GW (ASAHI Intecc) supported by a Caravel MC (ASAHI Intecc) with IVUS guidance. We sequentially exchanged the GW from the Gaia third to stiffer wires with heavier tip load (Conquest Pro 12 and Conquest Pro 8–20, ASAHI Intecc). However, we could not cross the GWs to the CTO. We could not control the GWs intentionally because the tip of GWs could not be deflected by hard tissue due to the enlarged subintimal space (Fig. 2B). Thus, we pulled out the IVUS catheter and inflated a balloon (Euphora, 2.0 × 15 mm) in the subintimal space at 10 atm to occlude the space and to deflect the GW. We then advanced the Gaia third GW supported by the Caravel MC in the direction that we confirmed using IVUS (Fig. 3A, B). The Gaia third GW became controllable and crossed to the distal true lumen (Fig. 3A–C). After pulling out the 2.0 mm balloon, we confirmed that the GW was in the intimal

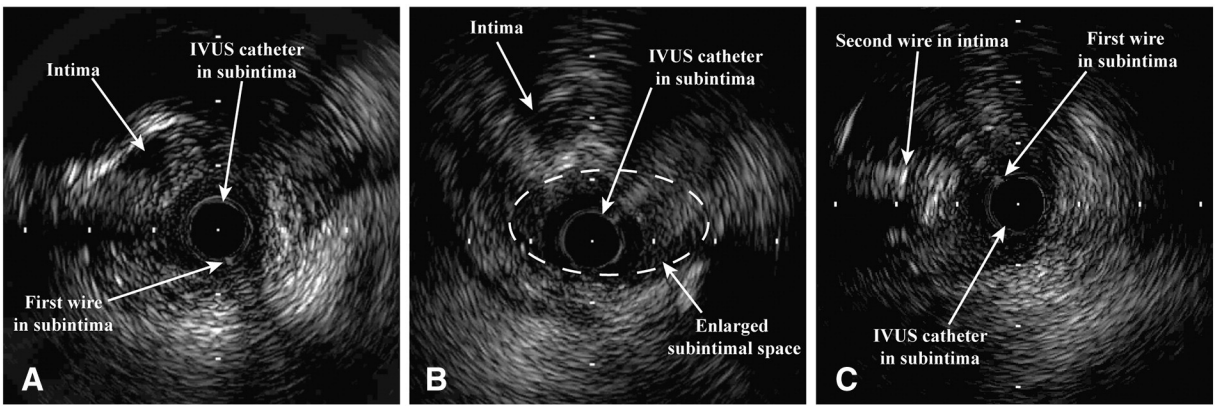


**Fig. 2.** IVUS images. A: The IVUS shows the guidewire is in the subintima. The intimal lumen is observed at the 10–11 o'clock position. B: The subintimal space is enlarged after balloon dilatation and IVUS-guided parallel wire technique. C: The second wire is in the intima after successful wire crossing with controlled antegrade intimal tracking with subintimal balloon inflation.

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