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Intravascular ultrasound-guided reconstruction of chronic total occlusion true lumen after failed subintimal tracking and re-entry

Short title: IVUS-guided CTO PCI after failed investment procedure

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Subintimal plaque modification (SPM) (also termed an “investment procedure”) by subintimal tracking and re-entry (STAR) with subsequent balloon dilatation is a bailout strategy in failed chronic total occlusion (CTO) percutaneous coronary intervention (PCI) [1]. Little is known about the treatment of long-tract dissections resulting from unsuccessful SPM at follow-up.

A 74-year old female with a history of diabetes mellitus presented with Canadian Cardiovascular Society class III angina. Transthoracic echocardiography showed preserved left ventricular ejection fraction. Coronary angiography demonstrated CTO of the proximal right coronary artery (RCA) with a blunt proximal cap and high tortuosity (J-CTO score 2) (**Figure 1A**, Supplementary material, *Video S1*). After failed CTO recanalization using antegrade wiring, controlled antegrade dissection and re-entry as well as futile retrograde collateral crossing, the STAR technique was attempted in the distal RCA. Provided that the knuckle wire failed to re-enter into the true RCA lumen and went into the extraplaque position along the

posterolateral artery, SPM was performed using a regular semi-compliant 3.0 mm balloon in the mid-to-distal RCA (Figure 1B, C, Supplementary material, Videos S2, S3). Angiography after 3 months showed a long-tract double-barrel dissection with obstructive residual stenosis in the distal RCA (Figure 1D, Supplementary material, Video S4). Based on patient's persisting symptoms, the decision on reconstruction of the true RCA lumen was undertaken. To this end, intravascular ultrasound (IVUS) was used for localization of the true lumen entry, and puncture using Gaia Third guidewire (Asahi Intecc, Nagoya, Japan) was performed (Figure 1E, Supplementary material, Videos S5, S6). After IVUS confirmation of Gaia Third intraluminal position, the double-lumen microcatheter was advanced through the entry site and the posterior descending artery was successfully wired using the Sion blue guidewire (Asahi Intecc, Nagoya, Japan) (Figure 1F, G, Supplementary material, Video S7). Following true-to-true lumen dilatation, repeated angiography and IVUS performed after 2-months showed complete resolution of RCA false-lumen with TIMI 3 flow (Figure 1H, I, Supplementary material, Video S8). The patient remained asymptomatic at 6-month follow-up.

The presence of false lumen dissections compromising distal coronary flow is not a benign complication of SPM at follow-up. Herein, we introduce the IVUS-guided antegrade wiring as a novel CTO PCI strategy for staged reconstruction of CTO true lumen after failed SPM in lesions with limited retrograde access.

Supplementary material

Supplementary material is available at https://journals.viamedica.pl/kardiologia_polska.

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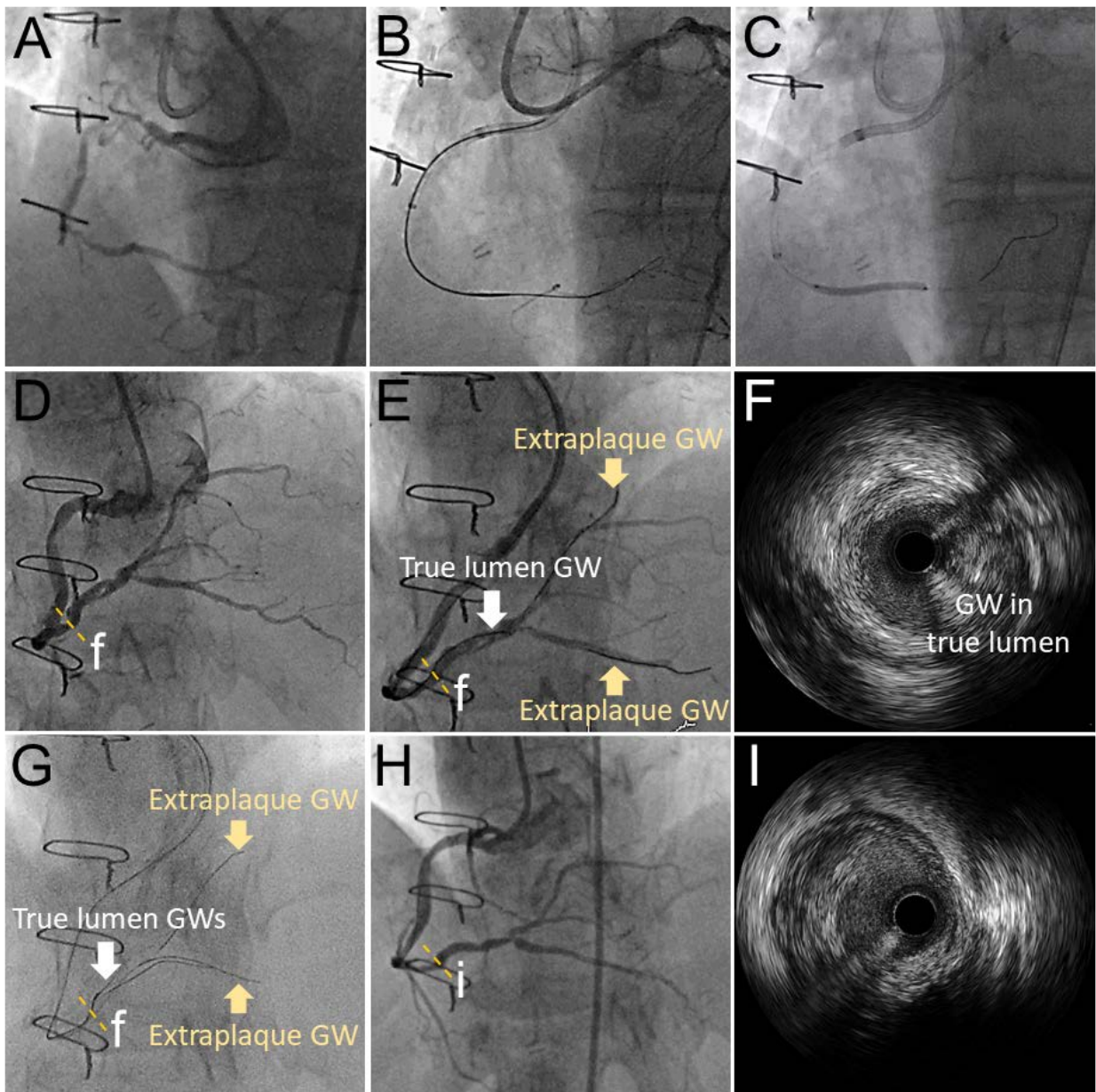


Figure 1. IVUS-guided antegrade wiring of the RCA true lumen after failed SPM. **A.** Baseline angiography showing CTO RCA. **B, C.** Failed subintimal tracking and re-entry with subsequent SPM in the distal RCA. **D.** Double-barrel RCA in control angiography. **E, G.** IVUS-guided puncture of the RCA true lumen using Gaia Third guidewire and the double-lumen microcatheter. **H, I.** Final angiographic and IVUS result with reconstitution of the RCA true lumen after 2-months

Abbreviations: CTO, chronic total occlusion; IVUS, intravascular ultrasound; RCA, right coronary artery; SPM, subintimal plaque modification