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Case Report

Dislodged stent after stent reverse controlled antegrade and retrograde subintimal tracking (CART) — Is stent reverse CART a necessary tool or an unnecessary evil?

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ABSTRACT

We report a case of stent reverse controlled antegrade and retrograde subintimal tracking (CART) in left anterior descending artery (LAD) chronic total occlusion. Reverse CART is the method used to make a connection between the retrograde wire and the antegrade true lumen by using a balloon to dilate the antegrade space and pushing the retrograde wire into this space. We successfully crossed the septal channel from right coronary to the LAD, and proceeded to reverse CART, which was unsuccessful. After demonstrating that both the retrograde and antegrade wires were in the same subintimal space by intravascular ultrasound (IVUS), we placed the distal stent edge at the connection point of the wires and deployed the stent. We could easily wire the stent lumen with the retrograde conquest 9 g wire. Afterwards we tried to push the retrograde corsair microcatheter through the CTO and into the antegrade guiding, but unfortunately, the retrograde corsair could not pass into the antegrade guiding and was stuck just outside the antegrade guiding ostium. At this point IVUS showed that the stent had been dislodged from the LAD and pushed into the aorta just outside the left main by the retrograde corsair because the retrograde wire passed into the stent lumen through a distal side strut opening and not through the true distal end of the stent. Due to unstable hemodynamics we had to remove the retrograde system and this led to stent embolism. The case illustrates stent dislodgement after stent reverse CART and stresses the importance of using IVUS to check fully the retrograde wire path before pushing the corsair. We discuss the role of stent reverse CART in the contemporary reverse CART era and conclude that it should be relegated to the very last resort after trying transit balloon technique. We conclude that stent reverse CART is mostly an unnecessary evil.

<**Learning objective:** The case illustrates the dangers of stent reverse controlled antegrade and retrograde subintimal tracking (CART) and discusses the alternative options to stent reverse CART, as well as how to perform stent reverse CART safely with the use of intravascular ultrasound both before stenting and after stenting to ensure correct wire passage through the stent.>

Introduction

Stent reverse controlled antegrade and retrograde subintimal tracking (CART) has been used as a method to overcome the problem of reverse CART. Stenting the chronic total occlusion (CTO) segment on the antegrade wire creates the biggest possible sustained lumen as a target for the retrograde wire. It prevents the recoil of tissue after ballooning and removes proximal vessel dissection flaps that can trap the retrograde wire. However, stent reverse CART is rarely necessary in the contemporary reverse CART era. Joyal et al. [1] in their landmark review of retrograde techniques describes stent reverse CART, but they state their preference to use guideline reverse CART instead. In the Asia Pacific CTO Club (APCTO) retrograde algorithm [2], stent reverse CART is placed as a cautioned last resort option, when there is connection between antegrade and retrograde wires shown on intravascular ultrasound (IVUS). There are of course other ways to create the biggest possible antegrade space for retrograde wire puncture

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without resorting to stent reverse CART, for example, the previously described technique of transit balloon by Wu et al. [3]. Since stent reverse CART is so rarely used, complications arising in stent reverse CART cases are extremely rare. We describe a case of dislodged stent by retrograde corsair after stent reverse CART and discuss the issue of whether stent reverse CART is a necessary tool or an unnecessary evil.

Case report

A 47-year-old man with past history of type II diabetes, hypertension, and hypercholesterolemia, presented with effort angina in 2015. He underwent an exercise tolerance test, which was positive. A coronary angiogram showed CTO to the right coronary artery (RCA) (Fig. 1a) and the left anterior descending (LAD) arteries (Fig. 1b). The circumflex artery had no significant stenosis. Antegrade CTO percutaneous coronary intervention (PCI) was successfully performed on the RCA with drug-eluting stent implantation, but the antegrade attempt to the LAD was unsuccessful, and he was referred to our CTO proctorship program.

Single femoral access with a EBU 3.5 8 French guiding (Medtronic, Minneapolis, MN, USA) for ipsilateral septal to septal collateral (Fig. 1b) was attempted in view of the decent size of the channel, but we were unable to cross the channel despite using Sion and XTR wires (Asahi Intecc, Nagoya, Aichi, Japan). Therefore a second femoral access for 7 French JR 4.0 (Cordis, Fremont, CA, USA) guide was placed to the RCA. There was a large Posterior Descending artery septal collateral channel to the LAD (Fig. 1c), which looked promising. We first treated the lesions in RCA and PDA with drug-eluting stents under IVUS guidance for securing safety of retrograde approach. Then a Sion wire (Asahi) supported by a 150 cm corsair catheter (Asahi) easily negotiated the channel (Fig. 1d). We began retrograde wiring with a XTA wire (Asahi) but the wire kept slipping into the high septal branch and failed to puncture the distal cap of the CTO (Fig. 1e). Therefore, an Ultimate Bros 3 g wire (Asahi) was used to puncture into the distal cap and wire into the mid portion of the CTO. As there was a sizeable diagonal branch just proximal to the proximal cap of the CTO, we decided not to attempt single retrograde wire crossing for fear of jeopardizing the large diagonal (Fig. 1f). A Gaia second wire (Asahi) was used to wire antegradely into the CTO but this wire went into the antegrade track produced by the previous antegrade attempt and ended up in a small septal branch that emerged about 6 mm into the CTO body (Fig. 2a).

We attempted to redirect the antegrade wire into the main LAD CTO, but it was not possible. Therefore we began contemporary reverse CART in the proximal part of the CTO using first a 2.0-mm balloon, then a 2.5-mm balloon, and even a 3.0-mm balloon. Despite using several retrograde wires including XTA, Gaia second, Gaia third, Sion Black, Conquest Pro 9 (all Asahi); we were unable to succeed in reverse CART (Fig. 2b). An IVUS examination showed that the retrograde and antegrade wires were connected in the

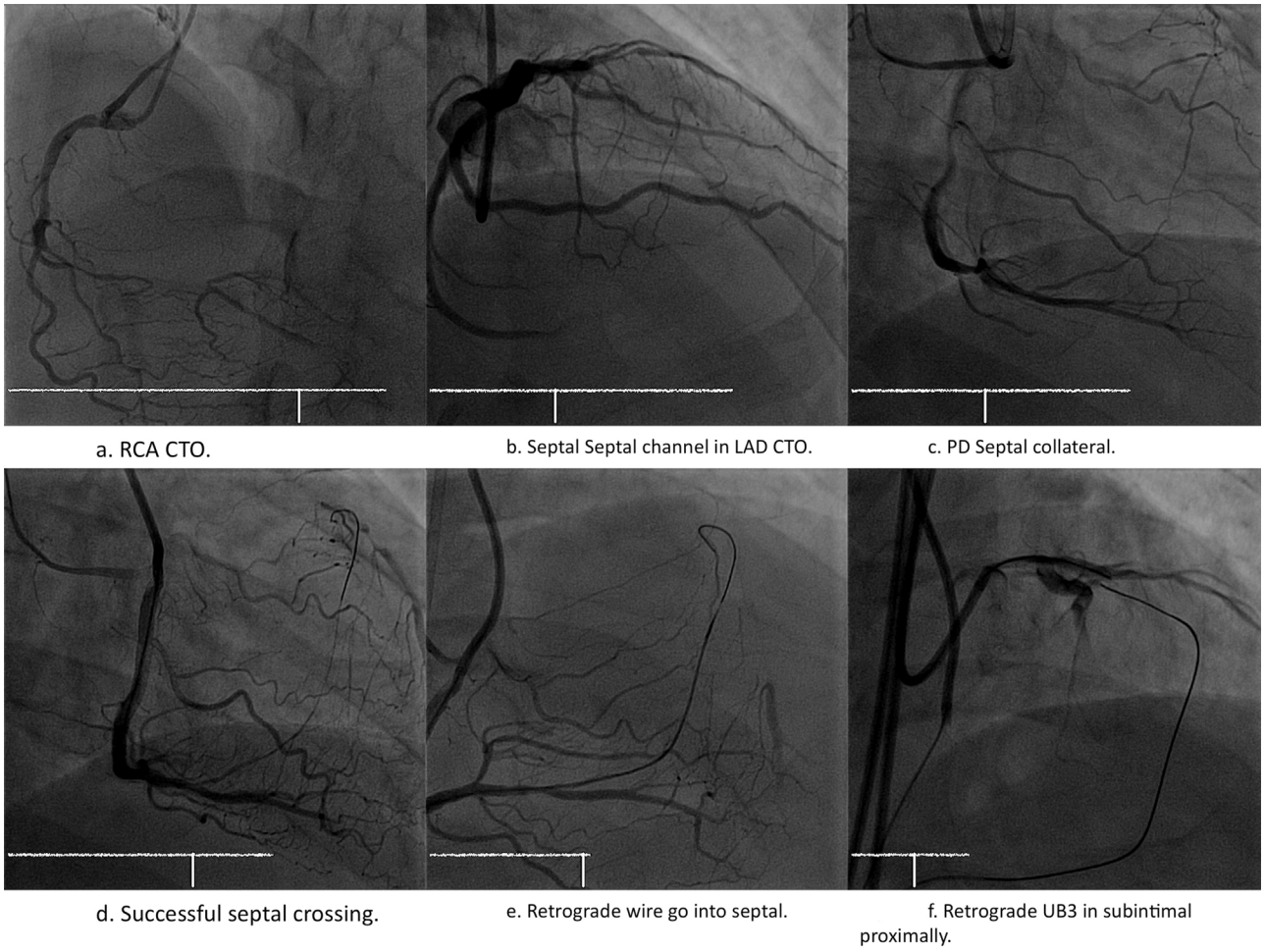

Fig. 1. (a) Right coronary artery chronic total occlusion (CTO). (b) Septal channel in left anterior descending artery CTO. (c) Posterior descending artery septal collateral channel. (d) Successful septal crossing. (e) Retrograde wires go into septal. (f) Retrograde Ultimate Bros 3 wire in subinitimal proximally.

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