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The effectiveness of super-selective injection with anchor balloon technique for collateral channel assessment

Hiroki Shibutani [a,*], Yuzo Akita [a], Yumie Matsui [a], Masahiro Yoshinaga [a], Masahiro Karakawa [a], Etsuo Tsuchikane [b]

[a] Division of Cardiology, Osaka Saiseikai Izuo Hospital, Osaka, Japan
[b] Department of Cardiovascular Medicine, Toyohashi Heart Center, Aichi, Japan

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ABSTRACT

The careful assessment of collateral channels is important for a retrograde approach for a chronic total coronary occlusion (CTO). This case report describes a percutaneous coronary intervention for CTO of the distal right coronary artery with good collateral circulation. All visible collateral channels failed by the retrograde approach; however, the procedure was successful using the distal atrial circumflex (AC) channel. Although this distal channel was poorly visualized on standard coronary angiography, it was clearly contrasted retrogradely from the CTO exit using a super-selective injection through the proximal AC channel as the antegrade flow was obstructed by the anchor balloon. This case highlights a unique super-selective injection with anchor balloon technique for collateral channel assessment.

1. Introduction

The retrograde approach is a novel technique for percutaneous coronary intervention (PCI) of a chronic total coronary occlusion (CTO). To improve the success rate of guidewire passage, selecting collateral channels is important. The septal and epicardial channels are often chosen as the route for retrograde guidewire crossing; the septal channel is the first choice in most cases because of its reduced tortuosity, shortened distance, ease of passage, and fewer complications [1,2]. However, collateral channel assessment is often difficult when using only the visual aspect of a standard coronary angiogram. Here, we present a case of CTO of the distal right coronary artery (RCA), wherein a unique super-selective injection with anchor balloon technique was effective for collateral channel assessment.

2. Case report

A 60-year-old man came to our hospital with exertional chest pain. His medical history was significant for hypertension and dyslipidemia. He underwent coronary angiography, which revealed a CTO lesion in the mid circumflex artery (Cx) and distal RCA (Fig. 1A). He was diagnosed with exertional angina, but refused to have coronary arterial bypass grafting. Therefore, he underwent an initial PCI of the Cx CTO lesion, and two drug-eluting stents (DES) were implanted from the proximal to distal Cx (Fig. 1B). Because he still complained of chest pain after the procedure, we performed a staged PCI for the RCA CTO lesion 3 months after the first PCI.

We inserted 8F sheaths from both femoral arteries. We used a SAL1.0 8F SH guiding catheter for the antegrade system and an AL2.0 7F guiding catheter for the retrograde system (Fig. 2A). We observed several collateral channels (Fig. 2B–D) on a standard coronary angiogram and initially performed a retrograde approach. We first attempted major septal channel tracking, but failed (Fig. 3A). Next, we performed septal surfing; however, the guidewire could not pass through the RCA CTO exit from the septal channels (Fig. 3B). We then attempted to cross the guidewire through the atrial circumflex (AC) channel. Two AC channels were connected to the RCA. Because we could see the proximal AC channel clearly, as compared to the distal channel, we attempted to cross the proximal channel (Fig. 3C). The proximal channel had an acute angle origin from the Cx; therefore, the anchor balloon technique was necessary in the mid Cx stented segment. However, the guidewire could not pass through this proximal AC channel because of its corkscrew shape (Fig. 3C). We then attempted a super-selective injection with anchor balloon technique through the proximal AC channel (Fig. 4A). Fortunately, the distal AC channel was clearly contrasted retrogradely from the RCA atrio-ventricular (AV) branch, which indicated that it had a direct connection to the RCA CTO exit. Therefore, we switched to the distal AC channel (Fig. 4B). The guidewire and micro catheter were able to pass to the CTO exit (Fig. 5A). Next, we initiated an antegrade preparation, and the antegrade guidewire was passed through the right ventricular (RV) branch. We performed a modified reverse controlled antegrade and retrograde tracking technique (Fig. 5B) and achieved externalization

* Corresponding author at: Division of Cardiology, Osaka Saiseikai Izuo Hospital, 3-4-5 Kitayama, Taisho-ku, Osaka 551-0032, Japan. Tel./fax: +81 6 6552 0091.
E-mail address: hs.vxvii@gmail.com (H. Shibutani).

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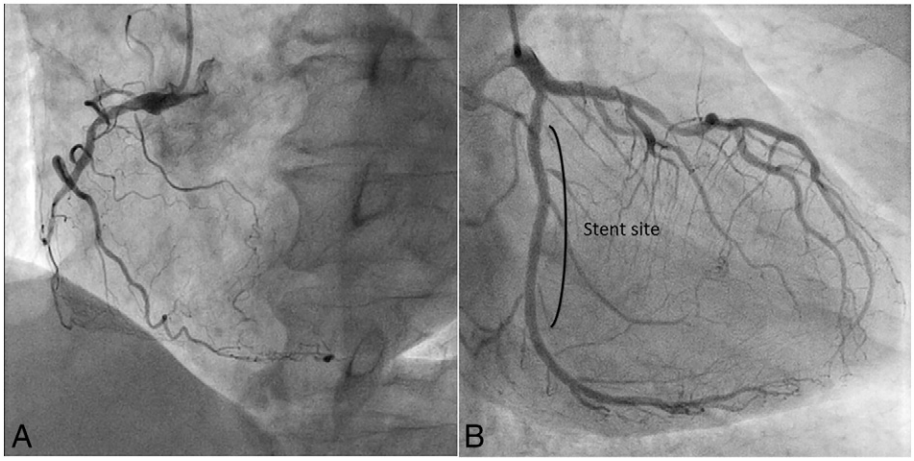

Fig. 1. Diagnostic coronary angiogram. A: The right coronary artery exhibits a chronic total occlusion in the distal portion. B: This patient first underwent PCI of the Cx CTO lesion. We implanted two DESs from the proximal to distal Cx.

(Fig. 5C). Then, we implanted three DESs from the proximal RCA to the AV branch (Fig. 5D). In doing so, we obtained good blood flow.

3. Discussion

We experienced a case of CTO of the distal RCA with good collateral circulation. The present case highlights the following two important clinical suggestions for the successful treatment of CTOs. First, a retrograde approach was initially performed, and second, we found that a unique super-selective injection with anchor balloon technique is useful for collateral channel assessment.

The first clinical suggestion involves using a retrograde approach first. Although the antegrade approach is standard for PCI of CTOs, we felt that it would be difficult to accomplish the procedure using only the antegrade approach in this case. His coronary computed tomography revealed a long CTO length and positive remodeling at the CTO entry site; thus, a guidewire would easily be allowed into the subintimal space and crossing into the true lumen would be difficult. Furthermore, if the retrograde routes proved impossible to

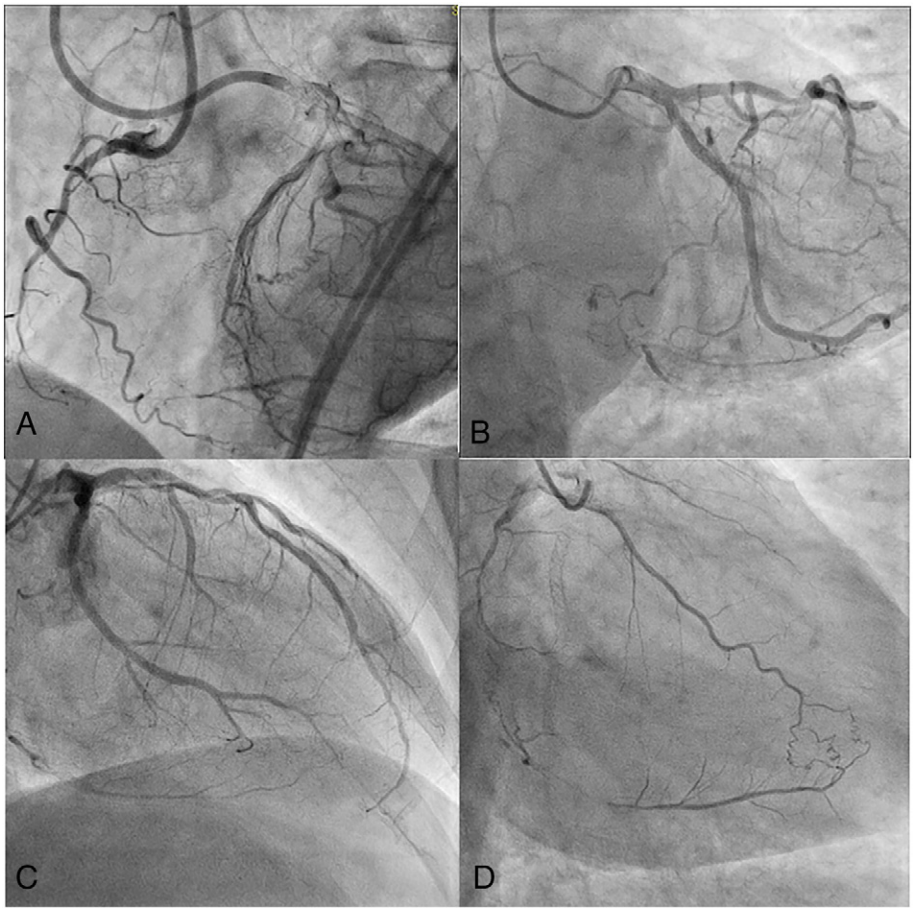

Fig. 2. Pre-intervention coronary angiogram. A: Dual injection. B: Collateral channel from the AC artery to the AV branch. C: Collateral channel from the septal branch to the PD artery. D: Collateral channel from the RV branch to the PD artery.

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