American Journal of Case Reports

ISSN 1941-5923
© Am J Case Rep, 2017; 18: 46-51
DOI: 10.12659/AJCR.901273

Received: 2016.08.27
Accepted: 2016.04.11
Published: 2017.01.13

A Case of Chronic Total Occlusion of the Left Anterior Descending Artery Successfully Treated with Side Branch Technique Using the Soutenir CV

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

ABCDEFG 1 Takeshi Niizeki
BE 1 Eiichiro Ikeno
E 2 Isao Kubota

1 Department of Cardiology, Okitama Public General Hospital, Kawanishi, Yamagata, Japan
2 First Department of Internal Medicine, Yamagata University School of Medicine, Yamagata, Japan

Corresponding Author: Takeshi Niizeki, e-mail: takeshi.niizeki@okitama-hp.or.jp
Conflict of interest: None declared

Patient: Male, 54
Final Diagnosis: Old myocardial infarction
Symptoms: Lower extremity swelling • respiratory distress
Medication: —
Clinical Procedure: Success
Specialty: Cardiology

Objective: Unusual setting of medical care

Background: Success rates for treatment of chronic total occlusion (CTO) have dramatically improved in recent years with the development of new CTO guidewires and development of new techniques such as the retrograde approach. In the antegrade approach, a guidewire is occasionally passed through a side branch despite successful wire crossing of the CTO lesion. In order to pass a wire through the main artery, there are a few side branch techniques such as a reverse wire technique.

Case Report: A 54-year-old man with symptoms of heart failure was admitted to our hospital. Coronary angiography showed CTO of the proximal left anterior descending artery. Percutaneous coronary intervention with an antegrade approach was started. We succeeded in passing the wire through a side branch but not the main artery. Unfortunately, a reverse wire technique failed in this case. Next, the wire passed through a side branch was exchanged with the Soutenir CV, and a retrograde approach was started. The wire crossing from retrograde was entwined around the Soutenir CV. After that, the retrograde wire was snared and guided to the antegrade guiding catheter, which resulted in successful wiring into the main artery easily.

Conclusions: The side branch technique using the Soutenir CV may be an effective strategy in some cases.

MeSH Keywords: Case Reports • Coronary Artery Disease • Percutaneous Coronary Intervention

Full-text PDF: http://www.amjcaserep.com/abstract/index/idArt/901273

Background

Success rates for treatment of chronic total occlusion (CTO) have dramatically improved in recent years with the development of new CTO guidewires, advances in microcatheters, and development of new techniques such as the retrograde approach [1,2]. In addition, the percutaneous coronary intervention (PCI) outcomes for CTO lesions have improved in recent years due to a better understanding of the physiopathology of the disease [1,2]. Even under such circumstances, a careful antegrade approach is very important in PCI for CTO. In the antegrade approach, a guidewire is occasionally passed through a side branch despite successful wire crossing of the CTO lesion. In order to pass a wire through the main artery, there are a few side branch techniques such as a reverse wire technique [3,4]. Unfortunately, the reverse wire technique failed in this case. Next, the wire passed through a side branch was exchanged with the Soutenir CV, and a retrograde approach was started. The wire crossing from retrograde was entwined around the Soutenir CV. After that, the retrograde wire was snared and guided to the antegrade guiding catheter, which resulted in successful wiring into the main artery easily.

We herein report a case of CTO that was successfully treated with a side branch technique using a Soutenir CV. This method appears to be hopeful as a novel side branch technique for a substantial number of CTO patients.

Case Report

A 54-year-old man presenting with symptoms of heart failure including respiratory discomfort and lower limb edema was admitted to our hospital. On arriving at our hospital, he had class III congestive heart failure according to the New York Heart Association criteria. An electrocardiogram revealed poor R-wave progression in the anterior chest leads and no significant ST-T change. Chest x-ray film confirmed bilateral pleural effusion, cardiomegaly (cardiothoracic ratio: 56.28%), and pulmonary congestion. Although blood tests showed an elevated B-type natriuretic peptide (BNP) value at admission (461 pg/mL), the value of BNP was significantly decreased at discharge (130.9 pg/mL). Biochemical analysis revealed no significant findings: blood urea nitrogen of 12.7 mg/dL (reference value [RV]: 8.00–22.00), creatinine of 0.43 mg/dL (RV: 0.60–1.10), estimated glomerular filtration rate of 132.7 mL/min/1.73 m^2, C-reactive protein of 0.05 mg/dL (RV: 0.00–0.30), and troponin T of 0.017 ng/mL (RV: 0–0.014). His coronary risk factors were hypertension, diabetes mellitus, dyslipidemia, and current smoker. He had no other noteworthy past medical history. Transthoracic ultrasonography showed reduced movement of the left ventricular anterior wall (left-ventricular ejection fraction: 36%), suspicious for heart failure resulting from ischemic heart disease. After the resolution of heart failure, cardiac catheterization was performed to identify the cause of heart failure. As shown in Figure 1A, left coronary angiography showed CTO of the proximal left anterior descending artery (LAD). Right

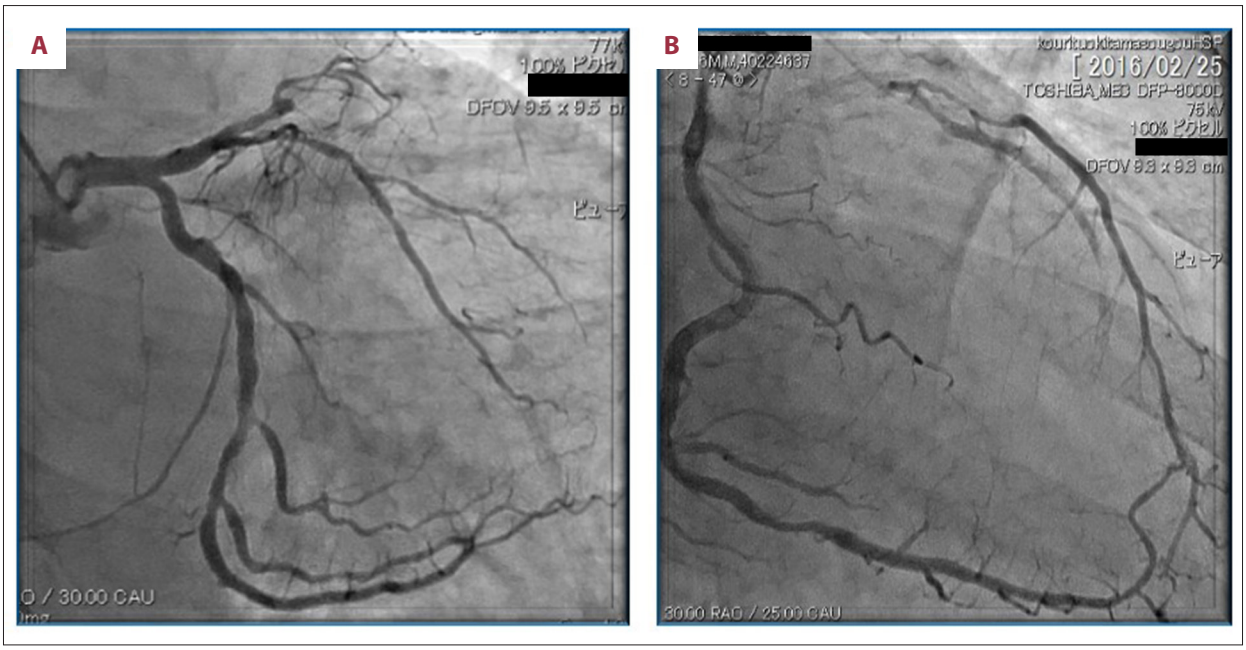


Figure 1. (**A**) Left coronary angiography (right anterior oblique caudal view). #7 100%. There is no significant lesion in the left circumflex branch. (**B**) Right coronary angiography (right anterior oblique caudal view). There is no significant lesion in the right coronary artery. There are good collaterals to the left anterior descending artery via the septal branches and the left ventricular apex.

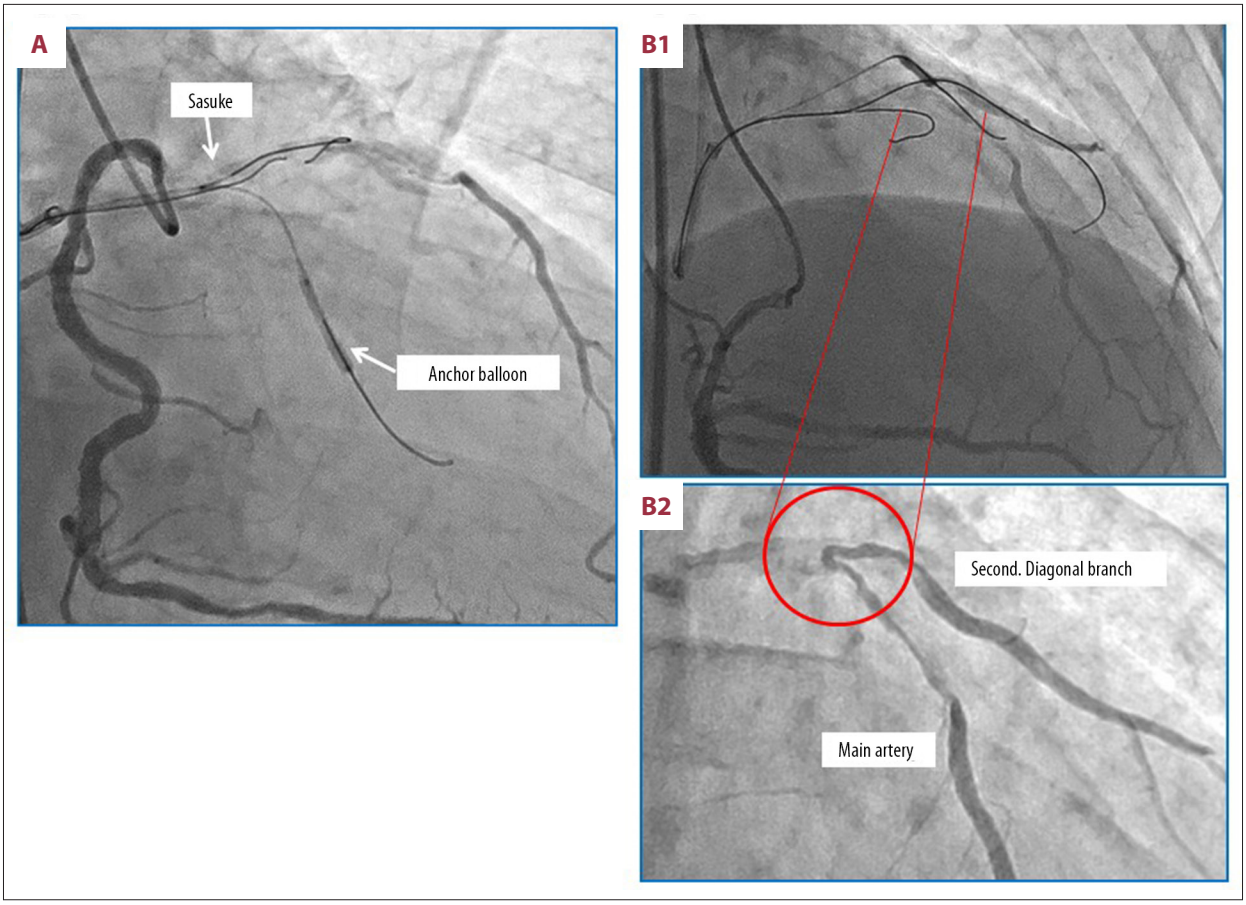


Figure 2. (**A**) An anchor balloon was placed in the first diagonal branch, and a soft wire was passed through the septal branch just before the CTO. The wiring using a Gaia Second was started with support of a Sasuke. (**B1**) The Gaia Second could cross the CTO lesion. Because the exit point of CTO was a true bifurcation with a steep angle, a wire could be guided only into the direction of the second diagonal branch. (**B2**) Enlargement of the CTO exit point.

coronary angiography revealed no lesion and good collaterals to the LAD via the septal branches and the left ventricular apex (Figure 1B). Because exercise stress myocardial scintigraphy revealed viability of the left ventricular anterior wall, we decided on elective revascularization by PCI.

The approach sites were the bilateral common femoral arteries. An antegrade guiding catheter of the SPB3.5 SH, 8Fr, 100 cm (Hyperion, Asahi Intecc Co. Ltd., Aichi, Japan) and a retrograde guiding catheter of the SAL1.0 SH, 7Fr, 90 cm (Hyperion, Asahi Intecc) were used. The procedure was started with the antegrade approach because this was the first attempt and the CTO lesion was short. Although the CTO lesion was short (approximately 15 mm in length), it was an abrupt-type CTO with severe calcification. Then, it seemed that sufficient backup was needed to perform a stable procedure. Therefore, a 2.5-mm balloon was placed in the first diagonal branch as an anchor. In addition, a soft wire (Sion blue; Asahi Intecc) was inserted into the septal branch just before the CTO, and wiring by a Gaia Second (Asahi Intecc) was started with support of a Sasuke (Asahi Intecc) (Figure 2A). We managed to insert the wire into the CTO carefully and gradually advanced it through the CTO lesion. However, the wire could be guided only in the direction of the second diagonal branch due to a severe angulation at the CTO exit site despite successful wire crossing of the CTO lesion (Figure 2B). Although the reverse wire technique was performed using a Sasuke and a Sion Black (Asahi Intecc), the wire could not be crossed into the main artery.

Then, the wire that passed through the second diagonal branch was exchanged with a Soutenir CV 3 mm (Asahi Intecc) using a Corsair 135 cm (Asahi Intecc) as shown in Figure 3A and Video 1. After that, a retrograde approach was started. The retrograde system could be easily established using the direct channel via the ventricular apex with a Sion (Asahi Intecc) and a Caravel 150 cm (Asahi Intecc). As shown in Figure 3B and Video 1, a Sion Black was passed through the second diagonal branch from retrograde and entwined around the Soutenir CV. After that, the retrograde wire was snared and successfully pulled inside the antegrade guiding catheter as shown in Figure 3C

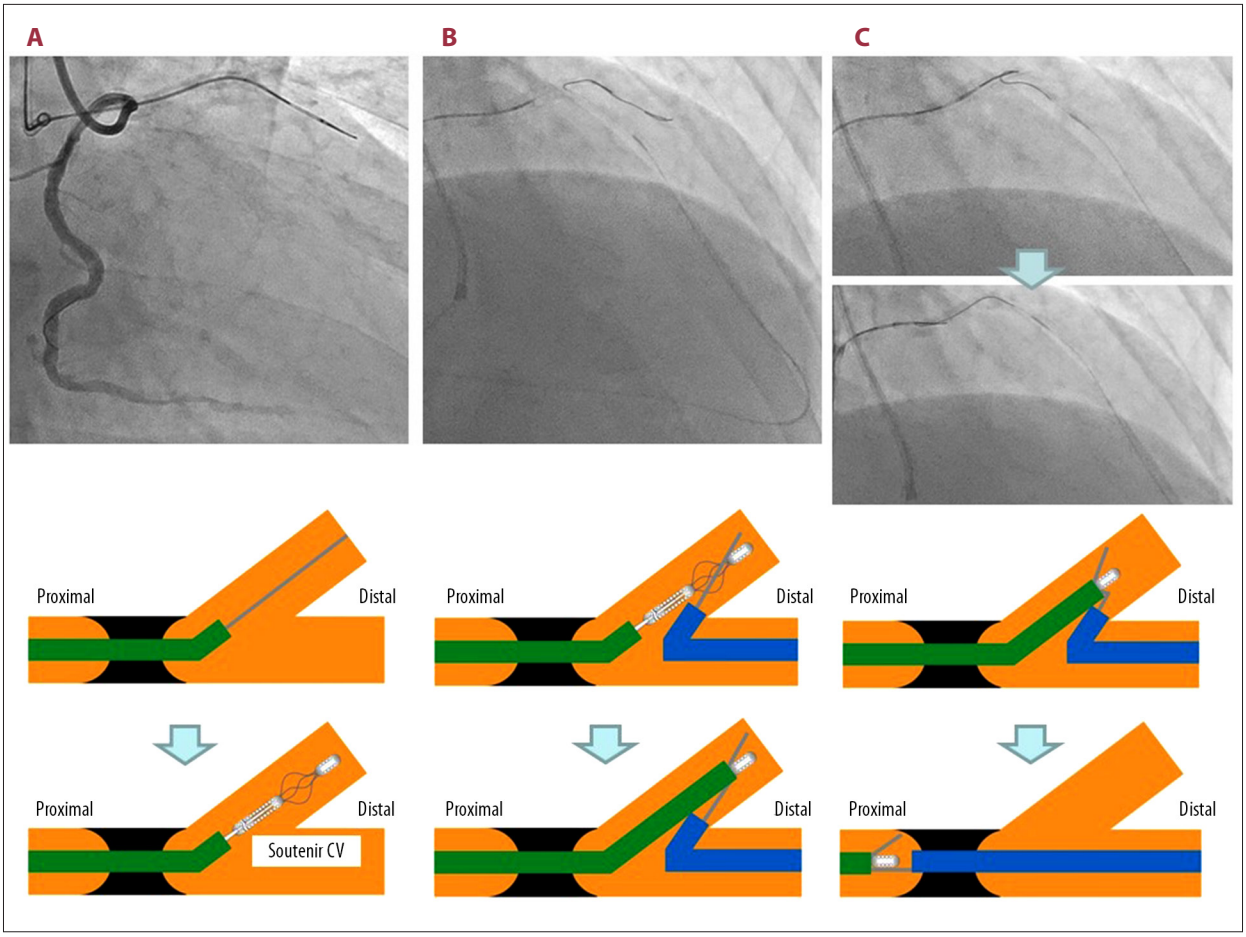
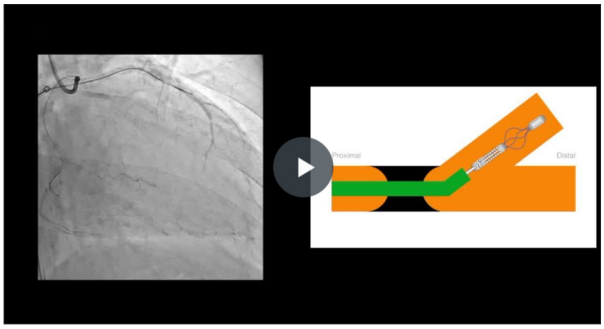


Figure 3. (**A**) A wire passed through a side branch was exchanged with the Soutenir CV by using a Corsair. (**B**) Retrograde approach was started; a wire from the retrograde approach was entwined around the Soutenir CV and the retrograde wire was snared. (**C**) The retrograde wire was pulled into the antegrade guiding catheter and was successfully externalized.

and Video 1. Next, the guidance of a Caravel into the antegrade guiding catheter from retrograde was successful. Then, the wire was exchanged with a RG3 (Asahi Intecc), resulting in successful externalization. Subsequently, predilatation was performed with a 2.5-mm balloon, and 2 drug-eluting stents (Xience Alpine 3.5×38 mm and Xience Alpine 3.0×23 mm) were deployed to fully cover the lesion, succeeding in revascularization of the CTO lesion (Figure 4A, 4B).



Video 1. (**A**) A wire passed through a side branch was exchanged with the Soutenir CV by using a Corsair. (**B**) Retrograde approach was started; a wire from the retrograde approach was entwined around the Soutenir CV and the retrograde wire was snared. (**C**) The retrograde wire was pulled into the antegrade guiding catheter and was successfully externalized.

Discussion

Ischemic heart disease is the primary cause of mortality in the world, especially in developing countries [5]. Thus, much effort has been made to improve the treatment of cardiac disease [6]. Treatment outcomes for CTO and long-term patency rates have dramatically improved in recent years with the development of new CTO guidewires, advances in microcatheters, and development of new techniques such as the retrograde approach [1,2,7]. However, the antegrade approach is the basic technique and plays an important role in PCI for CTO lesions. In the antegrade approach, there are cases in which a wire is passed through a side branch despite successful wire crossing

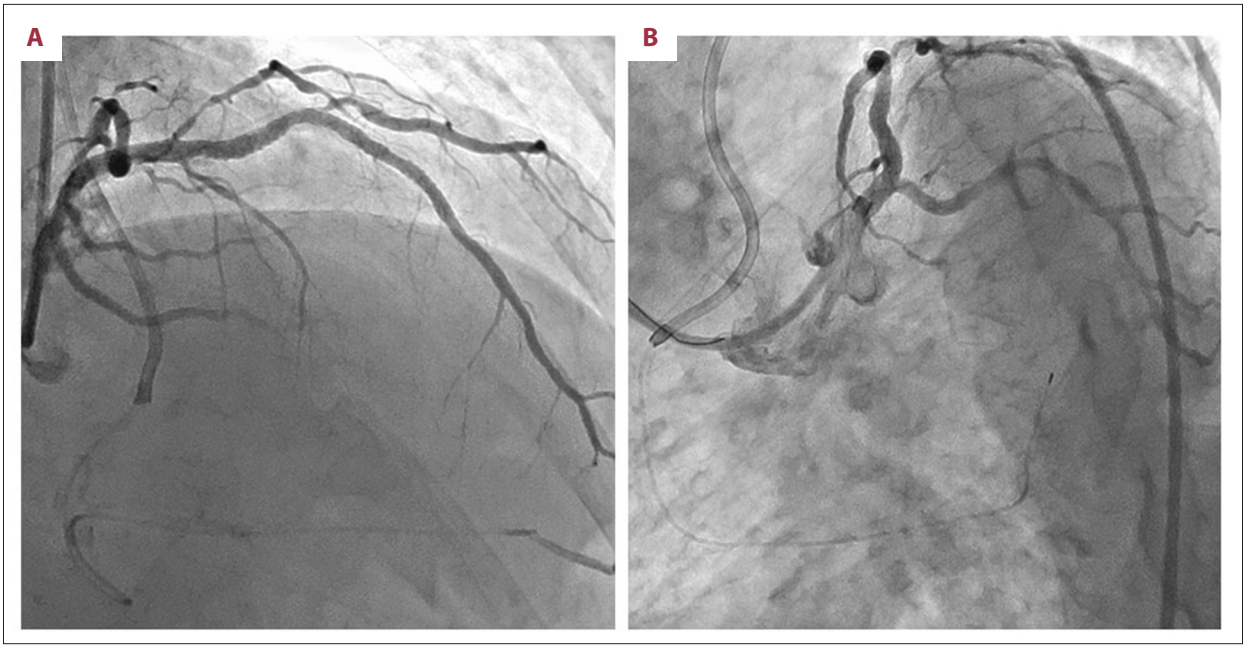


Figure 4. Final angiography. (**A**) Right anterior oblique cranial view. (**B**) Left anterior oblique caudal view.

of the CTO lesion. In order to pass a wire into the main artery, there are a few side branch techniques such as a reverse wire technique [3,4]. Although the reverse wire technique failed in our case, a retrograde wire was snared and caught using the Soutenir CV as stated above, which resulted in successful wiring into the main artery easily.

Not only in CTO lesions but also in bifurcation lesions with a severe curvature and stenosis, there is a situation in which a wire cannot be introduced into the main artery although wiring into the side branch is possible. In this situation, a general technique is tried at first to introduce a wire into the main artery with a multifunctional catheter [8]. However, this technique may be unsuccessful depending on the bifurcation angle and lesion type. Then, several techniques as shown below may be considered.

1. Reverse wire technique using a multifunctional catheter such as a Sasuke catheter [9].
2. Dilatation with a small balloon or ablation with a Rotablator in the direction of a side branch to create a space for wiring into the main artery.
3. Retrograde approach such as retrograde wire crossing and controlled antegrade and retrograde tracking (CART) if there are available collaterals [10].

Technique 1

Because the multifunctional catheter could cross the CTO lesions in our case, a reverse wire technique was attempted using a Sasuke and a Sion Black. However, this procedure unfortunately failed in our case. The wire operability of the reverse wire technique becomes restricted depending on the lesion type, often resulting in unsuccessful procedures. Additionally, multifunctional catheters are more difficult to pass than regular microcatheters. Therefore, this procedure cannot be performed if a multifunctional catheter cannot be passed, which is a disadvantage.

Technique 2

It may be effective to perform dilatation with a small balloon or lesion modification by a Rotablator in the direction of a side branch. However, dissection may occur in an unintended direction. Because it is very difficult to control the extent of dissection, there is a concern that wire passage into the main artery may become more difficult depending on dissection conditions. In addition, the Rotablator procedure has disadvantages related to its complexity, including setup and the possibility of complications unique to the Rotablator, such as perforation and slow flow.

Technique 3

The technique of reverse CART might be considered to be possible in this patient. However, accurate wire control in a retrograde approach is still difficult even with the recent guidewires. Therefore, a shortcut that follows crushing a side branch may occur depending on the penetrating points from the retrograde approach.

In this case, the wire passage into the second diagonal branch from retrograde was considered to be easy, because there were

promising collaterals for the retrograde approach. Accordingly, we exchanged the antegrade wire passed through the second diagonal branch with a Soutenir CV. Next, we entwined the wire from retrograde around the Soutenir CV and snared it into the antegrade guiding catheter, resulting in successful wire passage into the main artery. The Soutenir CV, a microsnare, is mainly used to grip and pull a retrograde guidewire through a CTO lesion and remove intravascular foreign matter [11,12]. There are two sizes of basket (3 mm and 5 mm). In this patient, a Soutenir CV with a 3-mm basket was used according to the diameter of the side branch. The Soutenir CV can pass through a microcatheter with a 0–020 inch lumen, and it can easily cross distal lesions of the coronary artery [11]. Miyashita et al. reported the successful removal of the broken IVUS catheter tip from the right coronary artery using the Soutenir CV [11]. In addition, Hara et al. reported that the Soutenir CV should also be considered as an option for gripping and pulling a retrograde guidewire in peripheral CTO lesions [12]. Comparing our technique with similar ones previously described, we used the Soutenir CV at the distal end of the CTO lesion for a novel side branch technique.

However, if there is some risk of complications with the retrograde approach (problems related to accessing the site [13], no promising interventional collateral channels, less experience of operator, etc.), we consider that our method of using the Soutenir CV is relatively contra-indicated. Because there were safe collaterals in this case, this procedure could be performed successfully in a short time without crushing a side branch. Thus, we suggest that this strategy of using the Soutenir CV might be the one of the useful methods in a substantial number of CTO patients.

Conclusions

We suggest that the novel side branch technique using the Soutenir CV can be an effective option when a wire is passed through a side branch but cannot be guided into the main artery in patients with CTO lesions.

Conflict of interest

There is no conflict of interest to declare.

References:

1. Muramatsu T, Tsuchikane E, Oikawa Y et al: Incidence and impact on midterm outcome of controlled subintimal tracking in patients with successful recanalisation of chronic total occlusions: J-PROCTOR registry. Eurointervention, 2014; 10: 681–88
2. Habara M, Tsuchikane E, Muramatsu T et al: Comparison of percutaneous coronary intervention for chronic total occlusion outcome according to operator experience from the Japanese retrograde summit registry. Catheter Cardiovasc Interv, 2016; 87: 1027–35
3. Martin-Yuste V, Alvarez-Contreras L, Brugaletta S, Sabate M: Distal side-branch technique: a new use for the Tornus® Catheter. Cardiovasc Revasc Med, 2014; 15: 97–99
4. Saito S: Open Sesame Technique for chronic total occlusion. Catheter Cardiovasc Interv, 2010; 75: 690–94
5. Han X, Liu L, Niu J, Yang J et al: Serum VEGF predicts worse clinical outcome of patients with coronary heart disease after percutaneous coronary intervention therapy. Med Sci Monit, 2015; 21: 3247–51
6. Ramesh D, Setty HS, Patil V et al: Use of CT angiogram in interventions involving coronary artery anomalies: A case series. Am J Case Rep, 2015; 16: 858–62
7. Okamura A, Yamane M, Muto M et al: Complications during retrograde approach for chronic coronary total occlusion: Sub-analysis of Japanese multicenter registry. Catheter Cardiovasc Interv, 2016; 88: 7–14
8. Nomura T, Higuchi Y, Kato T: Successful percutaneous coronary intervention for complex bifurcated lesions with combination of “Reverse wire technique” and “Reverse bent wiring with the crusade catheter” novel wire manipulation technique. Catheter Cardiovasc Interv, 2016; 87: 920–25
9. Nomura T, Kato T, Higuchi Y et al: Reverse bent wiring with Crusade catheter can be a useful technique for penetrating an abrupt-type entry of coronary occlusion at branching ostium. Cardiovasc Interv Ther, 2016; 31: 245–49
10. Christakopoulos GE, Karmpaliotis D, Alaswad K et al: Contrast utilization during chronic total occlusion percutaneous coronary intervention: Insights from a contemporary multicenter registry. J Invasive Cardiol, 2016; 28: 288–94
11. Miyashita Y, Saigusa T, Ikeda U: Novel microsnare successfully used to remove small debris from the right coronary artery. J Invasive Cardiol, 2011; 23: E161–63
12. Hara T, Wakatsuki T, Taketani Y et al: A case of successful use of microsnare to hold and pull the retrograde guidewire for the intervention to peripheral chronic total occlusion. Cardiovasc Interv Ther, 2013; 28: 287–90
13. Samul W, Turowska A, Kwasiborski PJ et al: Comparison of safety of radial and femoral approaches for coronary catheterization in interventional cardiology. Med Sci Monit, 2015; 21: 1464–68