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CORONARY, PERIPHERAL, AND STRUCTURAL INTERVENTIONS

CLINICAL CASE

Successful Management of a Fractured Microcatheter During Retrograde CTO Intervention

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ABSTRACT

We describe the successful management of a 60-year-old male patient with chronic chest pain, a history of hypertension, and previous percutaneous coronary intervention in the right coronary artery. After initial failure with an antegrade approach, a retrograde approach using a 1.7-F APT microcatheter (Instantpass, APT Medical) and guidewires resulted in the fracturing of the microcatheter within the septal branch. The decision was made to leave the fractured device in situ because of its minimal impact on coronary blood flow. Subsequently, the occlusion in the left anterior descending artery was successfully crossed using a CP 8-20 guidewire, and 2 drug-eluting stents were implanted. The patient had a favorable clinical outcome, with no restenosis or recurrence of symptoms at 12-month follow-up. This case highlights the challenges of chronic total occlusion intervention, particularly device fractures, and underscores the importance of tailored decision making and expertise in managing such complications. (JACC Case Rep. 2025;30:103122) © 2025 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

HISTORY OF PRESENTATION

A 60-year-old man presented to the cardiology department at Fudan University Zhongshan Hospital with chronic chest pain. He previously underwent right coronary artery (RCA) percutaneous coronary intervention (PCI) with everolimus-eluting stents. This admission was for an elective procedure.

PAST MEDICAL HISTORY

The patient had a history of hypertension but not diabetes or hyperlipidemia.

TAKE-HOME MESSAGES

- Calcified and tortuous coronary lesions can complicate retrograde interventions because the acute V-shaped angles formed in the collateral vessels increase the risk of microcatheter fracture.
- The decision to leave the fractured microcatheter in situ is crucial but may be acceptable on the basis of the absence of blood flow impairment and the patient's stability.

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ABBREVIATIONS AND ACRONYMS

CTO = chronic total occlusion

LAD = left anterior descending (artery)

PCI = percutaneous coronary intervention

RCA = right coronary artery

INVESTIGATIONS

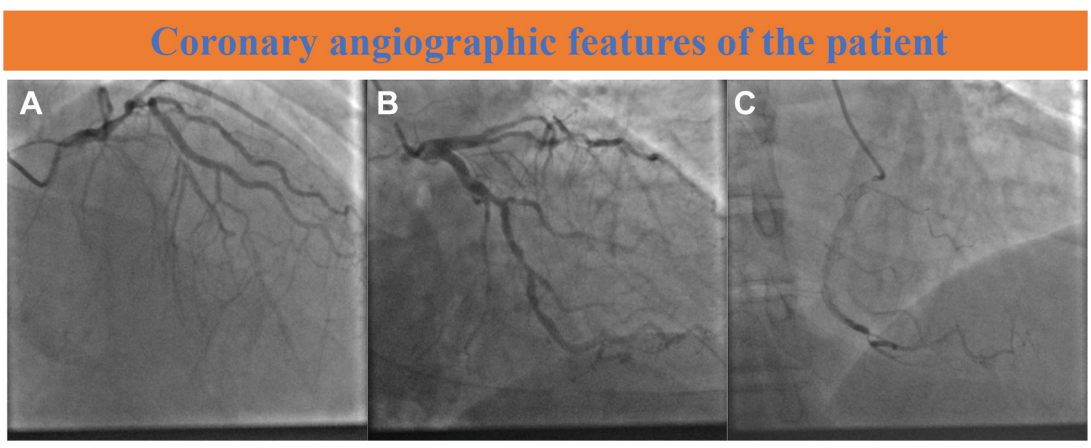
Angiography on admission revealed total occlusion in the proximal left anterior descending (LAD) artery, 80% stenosis in the midsegment of the left circumflex artery, no restenosis in the stented midsegment of the RCA, and 95% stenosis in the middle and distal segments of the RCA before trifurcation. The RCA lesion was successfully treated with stenting and drug-coated balloon angioplasty (Figures 1A to 1C).

MANAGEMENT

Initially, an antegrade approach failed because multiple guidewires could not penetrate the proximal fibrous cap. Given the patient's suboptimal retrograde collateral circulation, a 1.7-F 150-cm APT microcatheter (Instantpass, APT Medical) was then attempted to be advanced through same-side collateral vessels by using Sion and SUOH 03 guidewires (Asahi Intecc) to the distal LAD artery. However, both Fielder XT-R and XT-A guidewires (Asahi Intecc) failed to traverse the occlusion, and the Fielder XT-A guidewire broke. The attempt to retract the damaged retrograde Fielder XT-A guidewire was unsuccessful, resulting in the guidewire fracturing. Consequently, it was decided to try retracting the Fielder XT-A guidewire and the retrograde APT microcatheter together. However, because of the extreme tortuosity of the collateral vessels, the microcatheter broke within the collateral vessel during retraction of the guidewire and microcatheter. The fracture point was located approximately 100 mm from its tip (Figures 2A to 2F). The ruptured microcatheter was located almost entirely in the septal branch, so it had no effect on the patient's coronary blood flow, and the patient did not have symptoms such as angina pectoris.

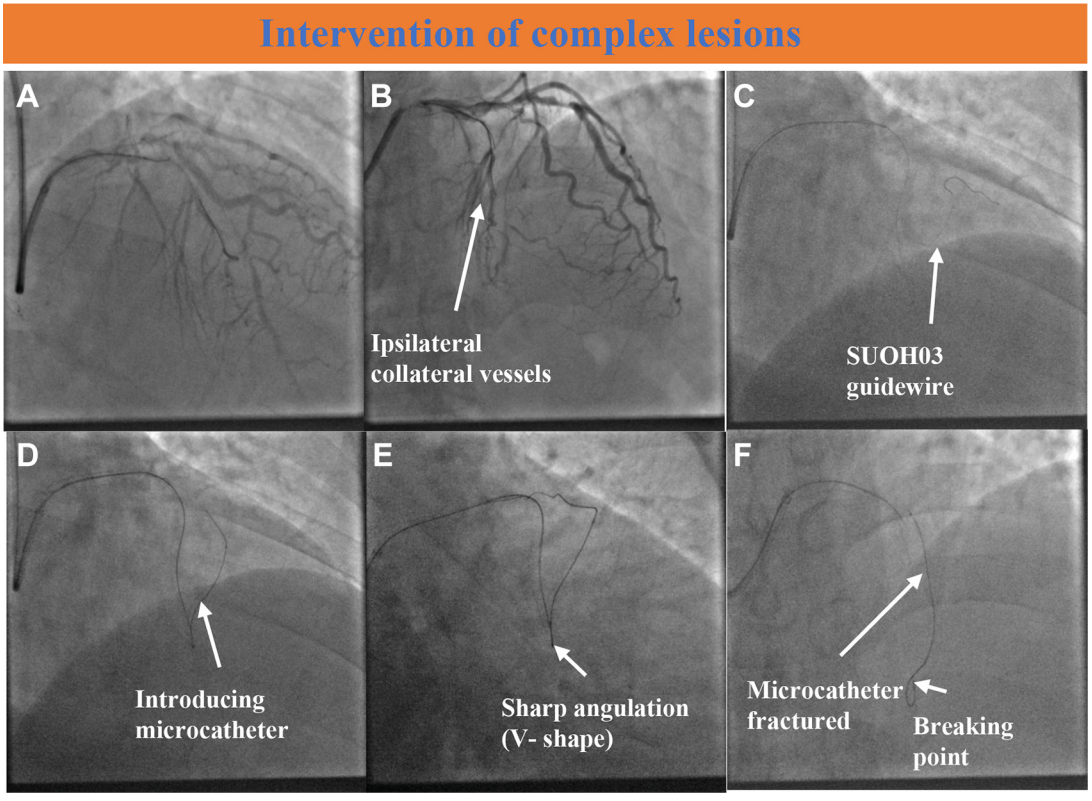
Post heart team consultation, a 150-cm Cravel microcatheter (Asahi Intecc) was used. The SUOH 03 guidewire helped navigate the 150-cm Cravel microcatheter through another same-sided collateral vessel to the distal LAD artery. Despite retrograde efforts with Gaia 3, Conquest 12 Pro, and CP 8-20 guidewires (all Asahi Intecc), direct passage through the occlusion failed. At this point, the antegrade approach was attempted, again using CP 8-20 guidewire with Corsair (Asahi Intecc). Under the guidance of retrograde guidewire, the CP 8-20 guidewire was successfully advanced through the occlusion in the LAD artery after multiple adjustments. We used another forward microcatheter to push the fractured microcatheter and guidewire into the septum branches. After balloon dilation, an intravascular ultrasound examination was performed on the LAD artery, and findings indicated that the fractured microcatheter was completely situated within the septal branch collateral vessel and did not protrude into the anterior descending branch. Given the patient's stable hemodynamics and the absence of significant discomfort symptoms, we decided to leave the fractured microcatheter in situ. Two drug-eluting stents

FIGURE 1 Coronary Angiography



(A and B) The images show complete occlusion of the left anterior descending artery. (C) The right coronary artery supplies very few collateral branches to the left anterior descending artery.

FIGURE 2 Unsuccessful Guidewire Passage Attempts



(A) Attempted passage of multiple chronic total occlusion guidewires failed to traverse the occluded segment of the left anterior descending artery. (B) Angiography reveals good collateral supply to the distal left anterior descending artery from the proximal left anterior descending artery through the septal branches. (C) The SUOH 03 guidewire (Asahi Intecc) successfully reached the distal left anterior descending artery through the septal branches. (D and E) Microcatheter support was introduced, but attempts with multiple chronic total occlusion guidewires were unable to pass through the occluded segment of the left anterior descending artery. (F) During the intervention process, the microcatheter fractured within the septal branch a result of the sharp angulation.

were implanted in the distal segment of the LAD artery. The subsequent angiography and intravascular ultrasound examinations confirmed that the stent was well apposed and fully positioned within the true lumen throughout its entire length (**Figures 3A to 3I**).

OUTCOME AND FOLLOW-UP

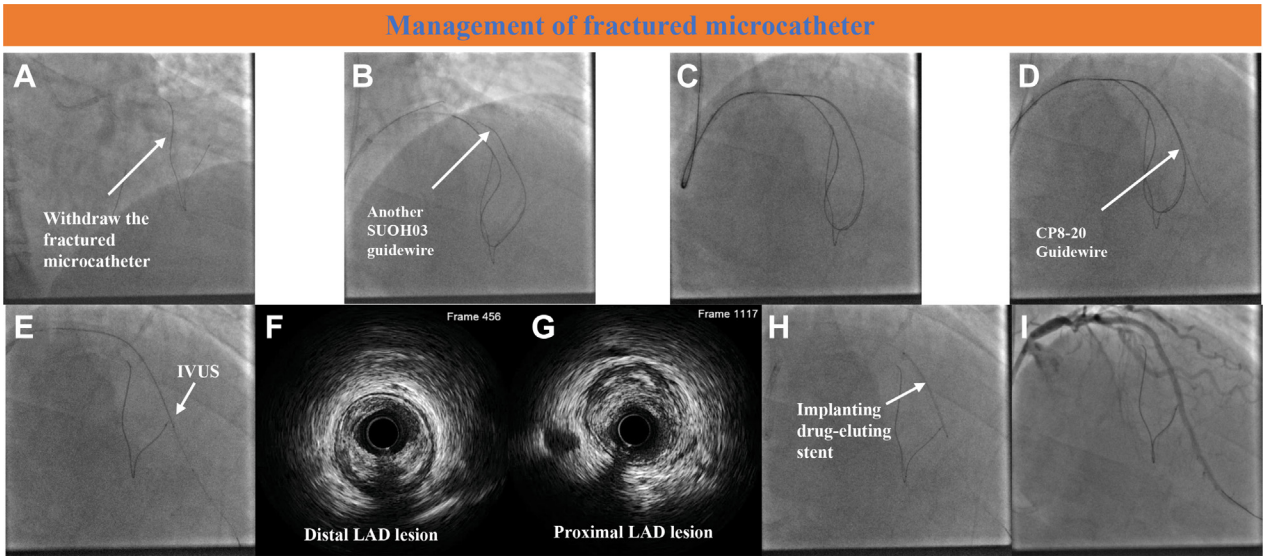
At 12-month follow-up, the stent in the LAD artery remained clear, with no significant restenosis, and clinically without signs of recurrence of symptoms of angina.

DISCUSSION

Cases of fractured and retained interventional devices continue to emerge, potentially linked to the challenges posed by calcified lesions in chronic total occlusion (CTO).[1,2] The tortuosity and calcification of the coronary arteries complicate the maneuvering and delivery of devices through these lesions. In our case, the anatomical structure of the coronary artery, along with excessive twisting of the microcatheter, caused the microcatheter's tip to break. This complication may be associated with the acute angles (V-shaped angles) formed in the collateral vessels, which represent the weakest points of the microcatheter structure.

Strategies to prevent this issue include limiting the number of rotations of the microcatheter and promptly releasing any tension. If necessary, the operator should consider replacing the microcatheter with a new model or adjusting the direction of operation. However, tension within the collateral vessels during retrograde intervention of CTO lesions can be

FIGURE 3 Successful Withdrawal of Microcatheter and Conquest of the Lesion, Confirmed by IVUS and Angiography



(A) Given the extreme tortuosity of the collateral branches, the fractured microcatheter could be withdrawn only to the proximal segment of the septal branch. (B) The SUOH 03 guidewire (Asahi Intecc) was passed through another collateral branch to the distal left anterior descending (LAD) artery occlusion. (C and D) Guided by retrograde SUOH 03 wiring, after multiple attempts, the CP 8-20 guidewire (Asahi Intecc) successfully passed through the occluded segment and reached the distal left anterior descending artery. (E to G) The occlusive lesion was successfully conquered, and IVUS examination confirmed that the guidewire was located in the true lumen of the vessel. (H) Two drug-eluting stents were implanted in the left anterior descending artery. (I) Postprocedure angiographic images of the left anterior descending artery.

misleading, requiring the operator to exercise greater precision and rely on extensive experience.

To the best of our knowledge, this is the first reported experience of microcatheter breakage and retention in a collateral vessel during retrograde intervention of a CTO lesion on the same side. Given that the fractured microcatheter is located within a smaller branch, we opted not to attempt further removal.

Currently, various techniques have been developed to address microcatheter tip fractures during PCI. These techniques include conventional balloon dilation, balloon capture, snaring techniques,[3] and rotational atherectomy, although their effectiveness remains a subject of debate. Alkhalil et al[4] previously reported a similar case in which they attempted to move the fractured tip by using rotational atherectomy to restore blood flow but were unable to reduce the fragment into smaller pieces, ultimately resulting in embolization of the fragment to a diagonal branch). Azzalini et al[5] also described a similar situation where they preemptively used a small balloon to trap the RCA, followed by atherectomy to reduce the size of the microcatheter fragments, thereby mitigating the risk of acute vascular occlusion.

Most previously reported microcatheter fractures have occurred within major vessels during antegrade operations and have been accompanied by restricted blood flow. However, in our case, the impact of a single branch on cardiac function was minimal. This case also prompts the question whether a fractured microcatheter can be pushed into smaller collateral branches in the future. Nevertheless, the final position of the microcatheter and its fragments is difficult to predict, so this technique should be regarded as an emergency measure only. The patient's favorable long-term prognosis reinforces the validity of the pragmatic decisions made during the management of this case.

CONCLUSIONS

This case illustrates the successful management of a fractured microcatheter during retrograde CTO

intervention in a patient with CTO. The decision to leave the fractured microcatheter in situ, on the basis of its location in a collateral branch and the lack of impact on coronary blood flow, proved to be a safe and effective approach. The use of alternative guidewires and techniques led to the successful completion of the procedure, with favorable long-term outcomes. This case emphasizes the importance of flexibility, experience, and precision in addressing complications during complex PCI procedures, particularly in the context of CTO lesions. It also suggests that, in certain cases, leaving a fractured microcatheter in place may be a viable option if the patient remains stable and the device poses no significant risk.

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KEY WORDS complication, coronary angiography, percutaneous coronary intervention