# Guidewire Entrapment Complicated by Stent Deformation and Left Circumflex Coronary Artery Dissection

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## Abstract

Coronary guidewire entrapment is an infrequent but potentially devastating complication of percutaneous coronary intervention.[1] Etiologies include guidewire jailing, wire deformation, inadvertent wire tip loop formation during withdrawal, complex vessel anatomy (heavily calcified, tortuous, or bifurcation lesions), and challenging procedural conditions. We present a challenging case of guidewire entrapment in a 41-year-old female, characterized by loop formation during wire withdrawal, resulting in stent deformation and iatrogenic left circumflex coronary artery (LCx) dissection. Our management strategy leveraged multiple retrieval techniques and intravascular ultrasound (IVUS) guided interventions to mitigate procedural complications.

**Keywords:** coronary guidewire entrapment, coronary artery dissection, intravascular ultrasound

## Introduction

Coronary guidewire entrapment is an uncommon complication during percutaneous coronary intervention that is more likely to occur in complex lesions. However, it can also arise in simple lesions if withdrawal under inadvertent looping of the guidewire tip is not carefully avoided. Retained guidewire fragments pose significant risks, potentially causing coronary occlusion or systemic embolization. Retrieval of retained guidewire fragments is recommended in most cases and should ideally be accomplished through percutaneous techniques, though surgical removal may be necessary in some instances. Forceful wire extraction can lead to stent deformation and coronary artery injury, potentially causing iatrogenic coronary artery dissection. Such dissections, while rare, are potentially devastating complications that can result in hemodynamic instability. Effective management of coronary artery dissection requires precise guidewire placement in the true lumen and appropriate stent implantation. IVUS plays a crucial role in ensuring adequate stent placement. This case report details the management of a

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guidewire entrapment complicated by iatrogenic coronary artery dissection, which was successfully addressed in a step-by-step manner, with no significant adverse sequelae.

## Case

A 41-year-old woman with a history of chronic myeloid leukemia, stable under nilotinib treatment, presented with progressive chest pain lasting 30 minutes. She was admitted with a diagnosis of non-ST-elevation myocardial infarction (NSTEMI) based on elevated cardiac enzyme levels. Coronary angiography revealed 70-80% stenosis in the mid-left anterior descending artery (mid-LAD), 90% stenosis in the distal left circumflex coronary artery (LCx), and diffuse insignificant stenosis in the right coronary artery (RCA).

The left coronary artery was engaged with a 6F EBU 3.5 guiding catheter, and a 180 cm Asahi Sion guidewire was advanced to the distal LAD. After pre-dilation, a 3.0 × 24 mm Resolute Onyx drug-eluting stent (DES) was deployed. Post-dilation with a 3.0 × 12 mm non-compliant balloon achieved Thrombolysis in Myocardial Infarction (TIMI) grade 3 flow with no significant residual stenosis (Figure. 1). Subsequently, the Sion guidewire was advanced to the distal LCx. Following pre-dilation, a 3.0 × 15 mm Integrity bare-metal stent (BMS) was deployed. Post-dilation with a 3.0 × 12 mm non-compliant balloon resulted in TIMI grade 3 flow with no residual stenosis (Figure 2). However, during this step, looping of the guidewire tip (Figure 2) went unnoticed, and the guidewire was pulled back without fluoroscopic guidance. This led to wire entrapment and stent deformation (Figure 3). One possible mechanism for guidewire entrapment in this case was through incomplete stent expansion. When the stent is not fully expanded, there can be gaps or areas where the stent struts are not fully apposed to the vessel wall. In this situation, a guidewire with a small loop may catch on these gaps in the stent structure, between the stent and the vessel wall. As the guidewire is withdrawn, the loop can become entangled in the stent struts, leading to entrapment. In our case, we attempted to release the entrapped wire using multiple techniques, including the use of a 1.9 Fr APT microcatheter, a 5.5 Fr GuideLiner, a Sapphire 1.0 × 5 mm balloon inflated to 8 bar, and a Mini-Trek 1.2 × 6 mm balloon also inflated to 8 atm. Despite these efforts, the wire could not be freed.

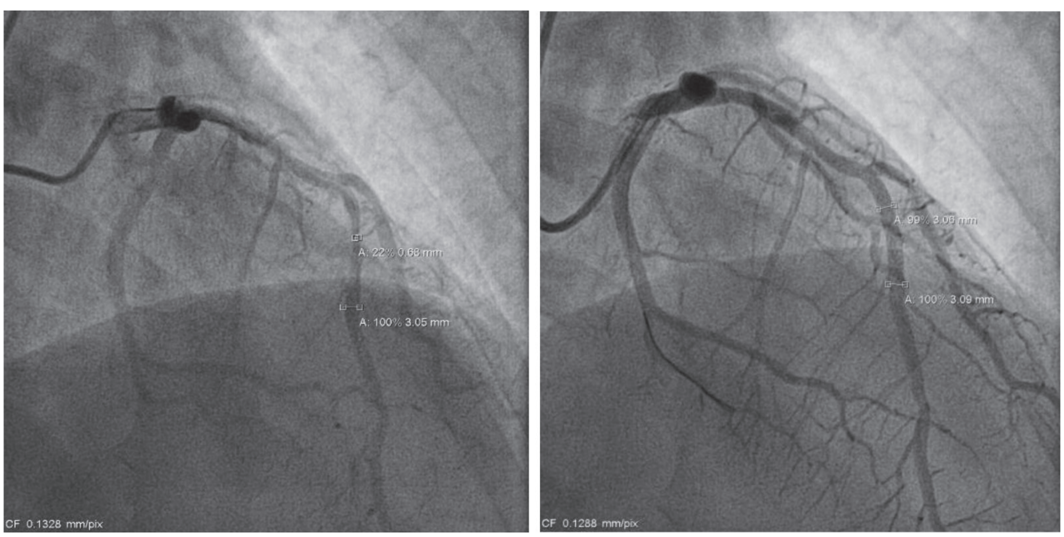


**Figure 1.** Coronary angiography shows the mid-LAD lesion (left) and the result, post stent deployment and balloon dilatation (right).

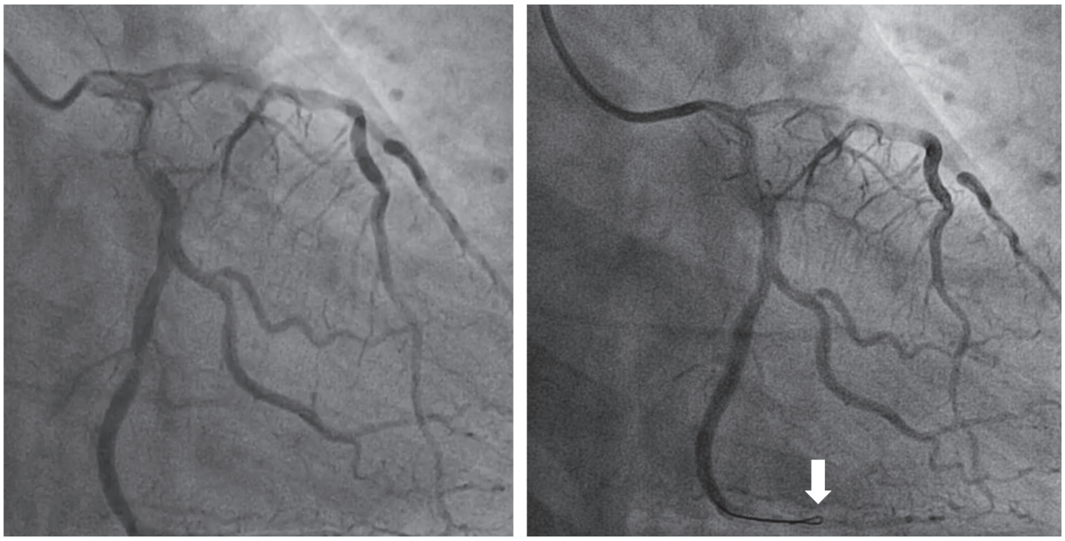

**Figure 2.** Coronary angiography shows the LCx lesion (left) and result, post stent deployment and balloon dilatation (right). Wire tip looping was also recorded (white arrow).

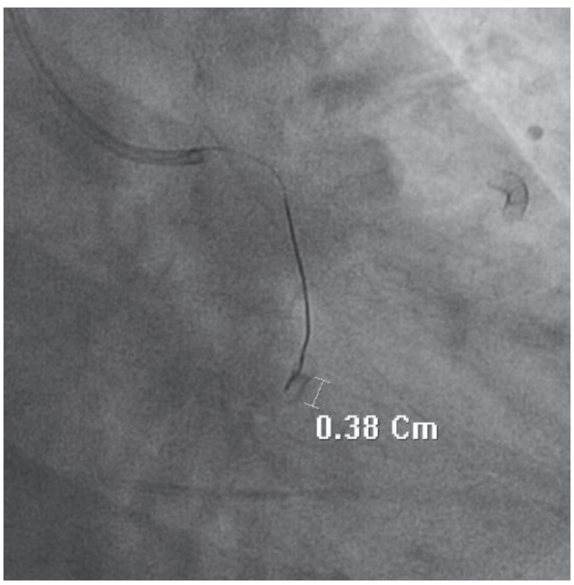


**Figure 3.** Wire entrapment upon stent structure, with stent deformation.

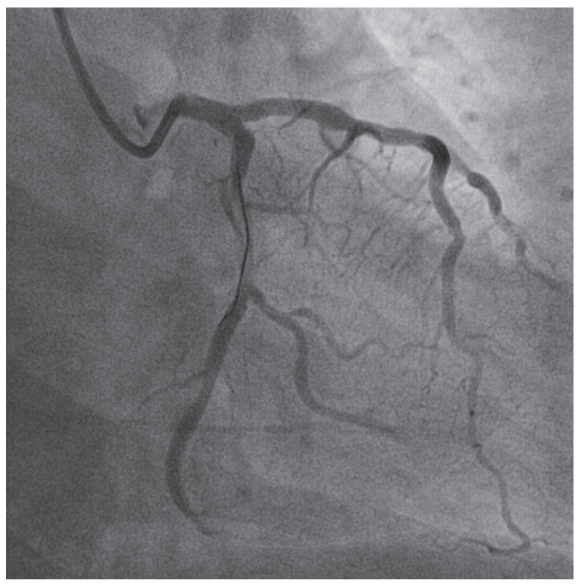

**Figure 4.** Proximal LCx type D dissection.

During this time, the patient developed worsening chest pain and cold sweat. Further imaging revealed a proximal LCx dissection (Figure 4), prompting the immediate placement of an intra-aortic balloon pump (IABP).

We then deployed IVUS through the entrapped wire, which revealed a dissection flap with a false lumen (Figure 5). To address this, we employed a CRUSADE double-lumen catheter, and advanced a second wire to secure the first obtuse marginal (OM) artery. Despite further attempts using a Finecross microcatheter, Corsair Pro microcatheter, and balloon inflation, the guidewire could not be released.

Ultimately, we used a 6F GuideLiner catheter combined with a Trek 3.0 × 20 mm balloon inflated to 6 atm to trap and extract the guidewire. Although this approach successfully removed the wire, the guidewire tip was left behind, and angiography revealed impaired distal LCx flow (Figure 6). To restore flow, we advanced a RUNTHROUGH wire to the OM and inflated a Trek 3.0 × 20 mm balloon to 6 bar. This restored blood flow, and a 3.0 × 30 mm Integrity stent inflated to 8 bar was deployed from the LCx to the OM.

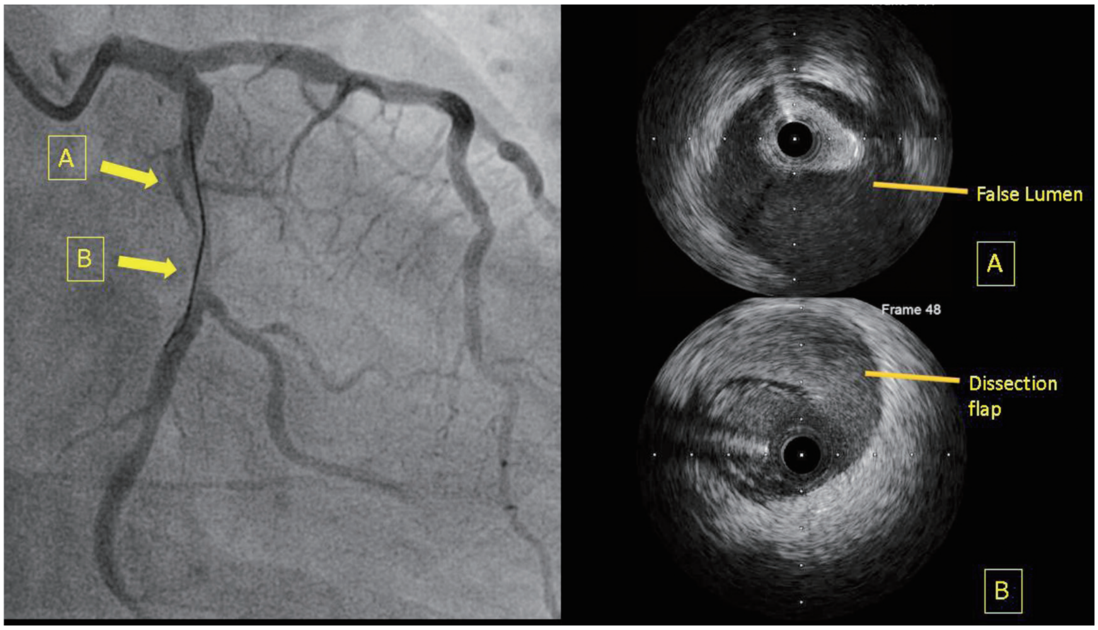


**Figure 5.** IVUS revealed false lumen with compression of the true lumen (A) and dissection flap (B).

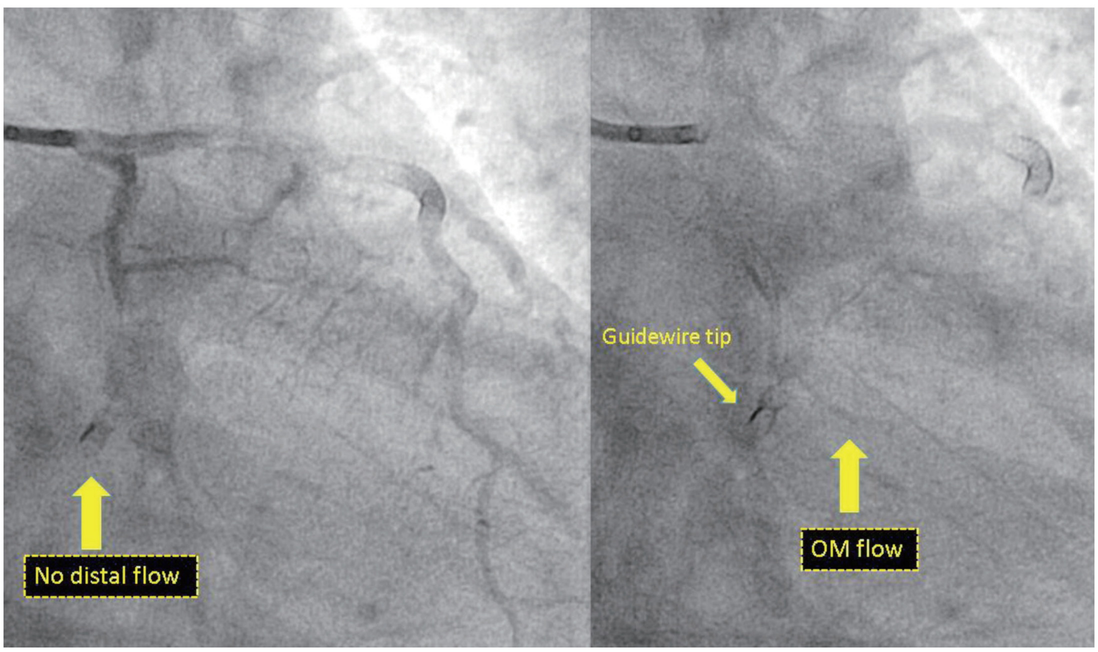


**Figure 6.** Angiography after wire retrieval showed guidewire tip left behind, and impaired LCx flow.

Subsequent IVUS imaging showed residual LCx hematoma but satisfactory OM stent expansion (Figure 7). For proximal LCx dissection management, we performed pre-dilation using a Euphora 3.0 × 30 mm balloon inflated to 8 bar for 90 seconds. We then deployed a 3.5 × 30 mm Resolute Onyx drug-eluting stent (DES), followed by post-dilation with a 2.75 × 12 mm non-compliant (NC) balloon at pressures ranging from 8 to 18 bar distally, and a 4.0 × 20 mm NC balloon at 10 bar proximally.

Final IVUS evaluation (Figure 8) confirmed the presence of a deformed stent and a retained broken guidewire tip, with no residual wire filaments left in the coronary artery. After performing a kissing-balloon technique using a 3.0 × 30 mm Euphora balloon in the LCx and a 3.0 × 12 mm NC balloon in the OM, both inflated to 8 bar, TIMI grade 3 flow was achieved.

The procedure was concluded successfully,

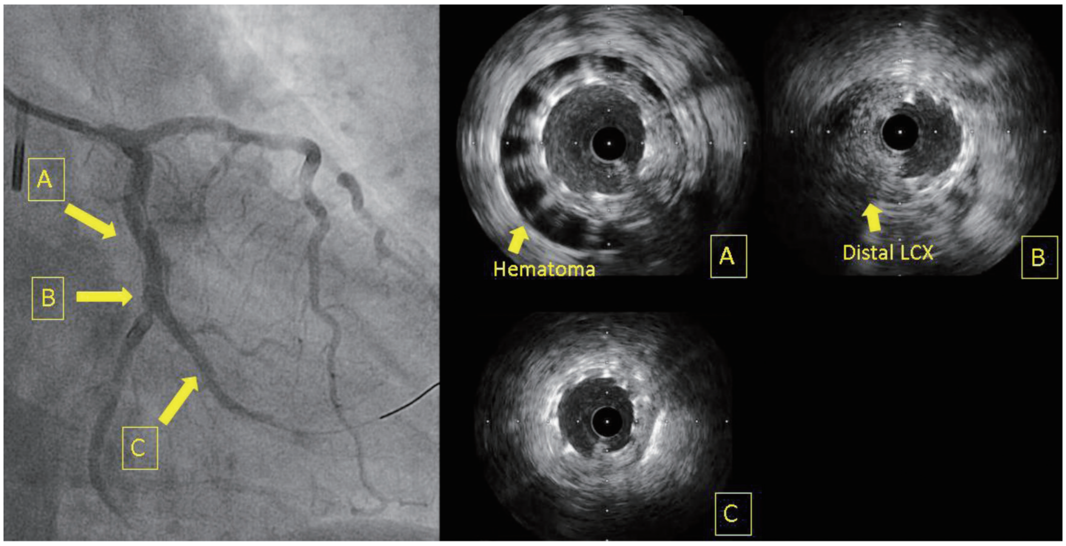


**Figure 7.** Residual LCx hematoma(A) and fair LCx, OM stent expansion without dissection (B.C).

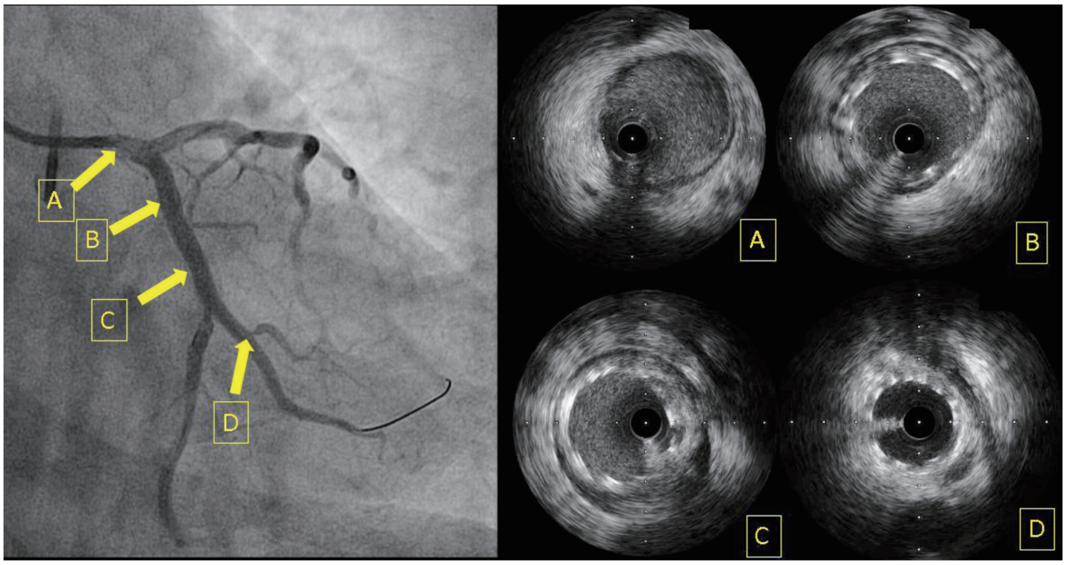


**Figure 8.** IVUS showed well-expanded stent and residual hematoma.

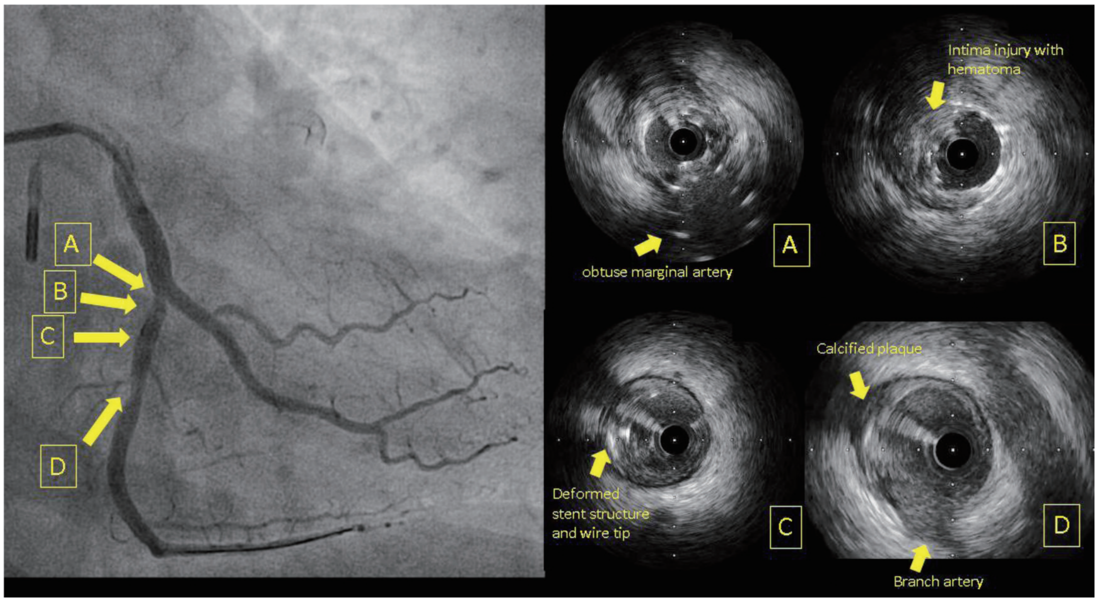


**Figure 9.** IVUS showed bifurcation stent status (A), stent deformation related intima injury (B), deformed structure with entrapped wire tip (C), and distal LCx calcified plaque (D).

and repeat coronary angiography five days later demonstrated patent stents with adequate flow. The IABP was removed, and the patient was discharged in stable condition with outpatient follow-up arranged. The patient was maintained on dual antiplatelet therapy with aspirin and Prasugrel. Over an eight-month follow-up period, she reported no chest pain and demonstrated independence in activities of daily living with no signs of heart failure. We will schedule an annual echocardiogram evaluation and consider CAG if any clinical symptoms suggest coronary artery restenosis.

## Discussion

Guidewire entrapment and fracture, which are more likely to occur in chronic total occlusions, heavily calcified or tortuous vessels and bifurcation lesions, can result in severe complications. Retained guidewire fragments are highly thrombogenic, posing risks of coronary occlusion or systemic embolization. Three therapeutic options may be considered: percutaneous retrieval, surgical removal, or leaving the retained fragment in situ.[3] Among these, a non-surgical approach is typically attempted first, though it carries risks of additional vascular trauma, coronary spasm, or further wire fragmentation. Various percutaneous techniques are available to address these complications.

One method involves advancing two or more guidewires alongside the entrapped wire and applying torque to all wires simultaneously. This twisting action wraps the wires around the retained wire, trapping it. The combined wire group is then retracted as a unit, pulling the entrapped wire into the guide catheter, where the entire system is externalized together.[4,5]

A second technique, the deep-guide catheter wedge with balloon inflation, involves advancing the guide catheter deeply into the vessel and over-wedging it. A balloon is then positioned at the distal end of the guide catheter, inflated to tightly trap the wire, and the entire system is retracted to retrieve the wire fragment.[6,7]

Another approach uses a Tornus microcatheter, which is advanced with controlled rotational movements to engage and release the entrapped wire tip. Additionally, a snare loop, particularly a gooseneck snare, may be employed to retrieve the wire fragment. This method is especially effective in proximal, large-caliber vessels.[8,9]

If the retained wire fragment cannot be freed and remains entirely within a side branch, stenting the fragment against the vessel wall may be a viable option.

In the case of our patient, we initially attempted wire retrieval using a microcatheter and balloon inflation; however, these efforts failed to release the entrapped guidewire. Repeated attempts ultimately resulted in iatrogenic LCx dissection. We subsequently employed a 6Fr GuideLiner catheter with a Trek 3.0 × 2.0 mm balloon to trap and retrieve the guidewire as a unit, leaving the guidewire tip behind. Given the dissection and retained tip, we opted for stenting against the vessel wall in the LCx.

Acute coronary artery dissection is a complex and heterogeneous condition that requires a multifaceted diagnostic and therapeutic approach.[10] PCI for coronary dissection should be performed by experienced operators, using intravascular imaging, and preferably with on-site surgical backup, due to the high risk of complications. The treatment strategy for coronary dissection largely depends on the location of the lesion and the severity of myocardial flow impairment. Maintaining guidewire position is critical during a dissection, as loss of wire position can complicate the procedure.[11] In some cases, when wire advancement across the dissected segment is not possible, or when wire position is lost, CTO techniques, such as antegrade dissection and re-entry, or retrograde approaches, can be leveraged to re-establish antegrade coronary flow.[12] In our case, we successfully re-entered the true lumen, as confirmed by IVUS. Before stent implantation, it is essential to use IVUS for comprehensive evaluation, and a cutting balloon may be considered to release any intramural hematoma. For extensive dissections, stenting to the distal edge is crucial to ensure complete lesion coverage and restore coronary flow. After stent deployment, IVUS plays a vital role in assessing stent expansion, edge optimization, and evaluating any residual hematoma. A study involving both IVUS and optical coherence tomography (OCT) in patients with spontaneous coronary artery dissection demonstrated the utility of these imaging modalities in clearly visualizing the true and false lumen, as well as intramural hematoma (IMH).[13] The increasing use of intracoronary imaging has proven invaluable in managing such complex cases and guiding therapeutic decisions.

In the literature, guidewire entrapment has been most frequently described in the management of complex vessel geometry. Our case is distinct in that it occurred in the setting of a non-complex lesion, where incomplete stent expansion and inadvertent guidewire looping likely contributed to the entrapment. Similar to reports of other cases, the entrapment was compounded by stent deformation and a resultant coronary dissection, which is a recognized but uncommon complication in such cases. There was also a unique challenge as the wire was entrapped in a way that did not allow for successful snaring or balloon inflation. This highlights the potential difficulty of retrieving a wire in cases where the guidewire interacts with a partially expanded stent, a mechanism that may not have been fully appreciated in earlier reports. As noted in other case reports, dissection following wire entrapment can lead to hemodynamic instability, requiring prompt intervention. In our case, an IABP was deployed immediately to stabilize the patient. Furthermore, successful management of coronary dissection in this context requires careful planning of stent deployment. We utilized IVUS to confirm appropriate guidewire positioning and to optimize stent placement. IVUS was critical not only to confirm the true lumen wiring but also to evaluate stent expansion and assess the presence of residual intramural hematoma, which can be an additional challenge when managing these complex cases.

## Conclusion

Withdrawal of a guidewire with a looped tip, especially in the context of an under-expanded stent, can lead to guidewire entrapment, stent deformation, and even iatrogenic coronary artery dissection. It is crucial to straighten the wire tip before removal and to perform the procedure under fluoroscopic guidance when withdrawing through a stent. A stepwise approach, utilizing various techniques and equipment, should be employed. Additionally, IVUS plays a significant role in the evaluation and management of coronary artery dissection, providing valuable information to guide treatment decisions.

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