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CASE REPORT

ADVANCED

CLINICAL CASE

Percutaneous Extraction of Deployed Coronary Stent During Retrieval of Jailed Buddy Wire

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ABSTRACT

Retrieval of a buddy wire following coronary stenting of long, tortuous, and calcified lesions runs the risk of wire entrapment and stent deformation. We report a case of successful percutaneous extraction of a longitudinally deformed coronary stent during retrieval of jailed buddy wire from the left anterior descending artery. (**Level of Difficulty: Advanced.**) (J Am Coll Cardiol Case Rep 2023;22:101989) © 2023 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/).

Use of buddy wire is an acceptable practice during coronary stenting of nontrackable, diffuse, tortuous, and calcified coronary lesions.[1] However, rarely, this runs the risk of the jailed wire getting trapped or jailed behind the stent. The stent may get deformed on retraction of the entrapped wire, leading to life-threatening complications.[2] Crushing with another stent or complete extraction of the stent from the coronary artery is required to prevent these complications.[3] Percutaneous extraction of a fully deployed stent is generally prohibited, as it may cause endothelial injury, coronary dissection, or even coronary perforation.[4] Although many reports have previously described retrieval of dislodged stents, reports on cases of fully deployed stents are rare.[4,5] We report a rare case of a successful percutaneous extraction of a longitudinally deformed deployed coronary stent during retrieval of jailed

LEARNING OBJECTIVES

- To highlight the need for adequate bed preparation and identify risk factors of jailed wire entrapment and stent deformation.
- To review the techniques for management of wire entrapment and coronary stent deformation.

FIGURE 1 Left Anterior Descending Artery Lesion

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

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ABBREVIATIONS AND ACRONYMS

CABG = coronary artery bypass grafting

DES = drug-eluting stent(s)

LAD = left anterior descending

LMCA = left main coronary artery

LV = left ventricular

NC = noncompliant

OCT = optical coherence tomography

SC = semicompliant

buddy wire from left anterior descending (LAD) artery.

HISTORY OF PRESENTATION

A 51-year-old man presented with worsening exertional angina of 6 months' duration.

He had a history of type 2 diabetes mellitus, hypertension, chronic kidney disease, and complete heart block (postpermanent pacemaker implantation).

DIFFERENTIAL DIAGNOSES

The differential diagnoses were coronary artery disease, valvular heart disease, and hypertensive heart disease.

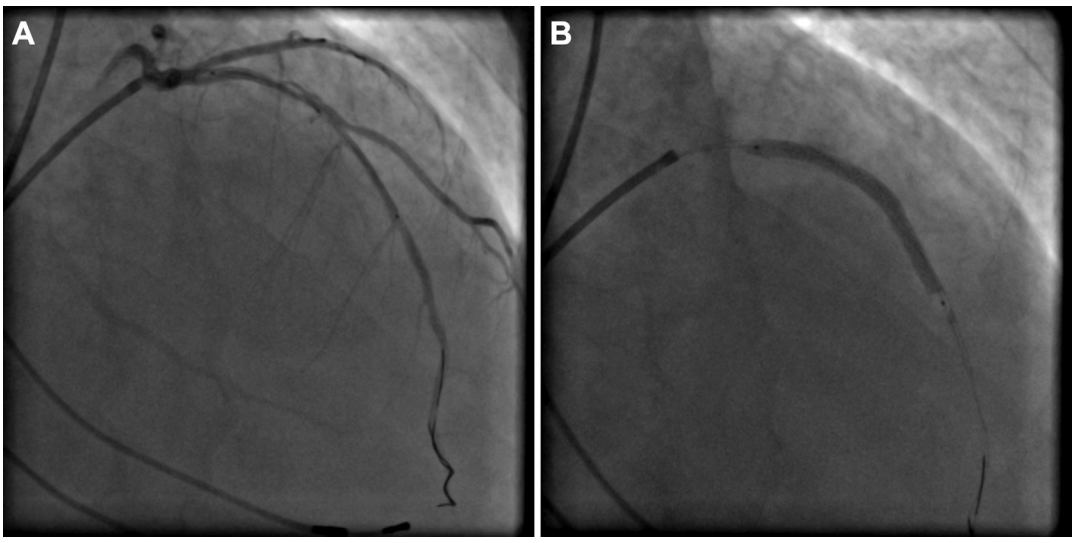
INVESTIGATIONS

Echocardiogram revealed LAD territory hypokinesia with preserved thickness and severe left ventricular (LV) dysfunction (ejection fraction: 30%). He underwent a coronary angiogram, which revealed 80% diffuse calcific disease in the mid- to distal LAD artery (Figure 1).

MANAGEMENT

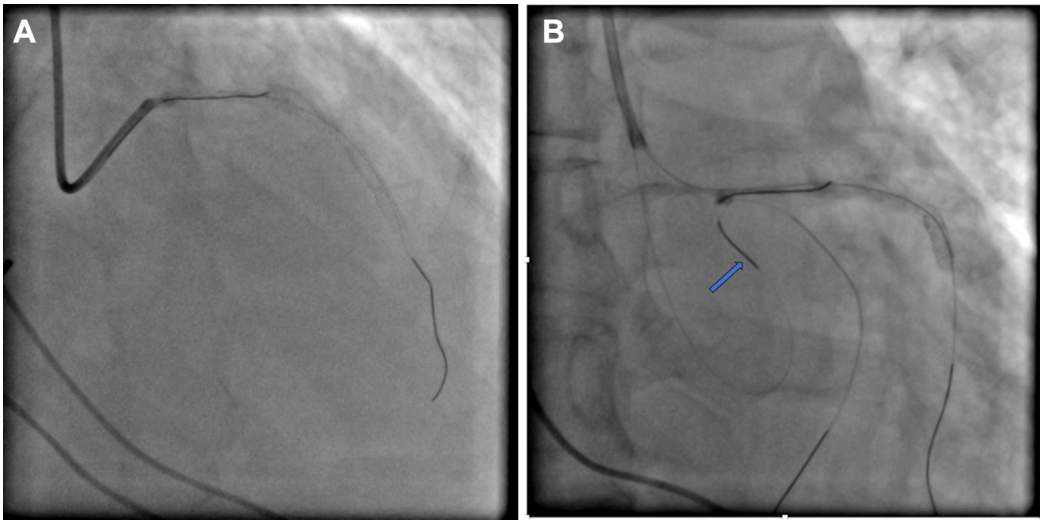
The patient was taken up for percutaneous coronary intervention to the LAD artery through the right radial route. After engaging left main coronary artery (LMCA) with extra backup (6-F, 3.5) guide, the LAD artery lesion was wired with a workhorse coronary wire. The lesion was predilated with 2.5-mm × 12-mm semicompliant (SC) balloon, followed by a 3.0-mm × 15-mm noncompliant (NC) balloon. After adequate predilatation, a 3.5-mm × 48-mm third-generation platinum-chromium everolimus drug-eluting stent (DES) was taken to the LAD artery. As the stent was nontrackable, an extra-support coronary wire was taken as a buddy wire and placed in the distal LAD artery (Figure 2A). The stent was tracked and was deployed at nominal pressure (Figure 2B). Before postdilatation, the buddy wire was carefully withdrawn. However, during the procedure, the wire got entangled with the proximal part of the stent (Figure 3). On controlled and gentle traction of the jailed wire, even with the support of a microcatheter and subsequently a 2-mm × 12-mm SC balloon, the wire got elongated, the proximal part of the stent got deformed, and it bunched up toward the LMCA (Figure 4). Urgent surgical consultation was taken for coronary artery bypass grafting (CABG). In view of prohibitive surgical risk, percutaneous extraction of the deformed stent was considered as the emergency bailout option with surgical backup. Activated clotting time was maintained above 250 seconds. However, neither a coronary balloon nor a microsnare could be tracked distal to the deformed stent.

FIGURE 2 Left Anterior Descending Artery Stenting



(A) Use of buddy wire. **(B)** Well-expanded stent after deployment.

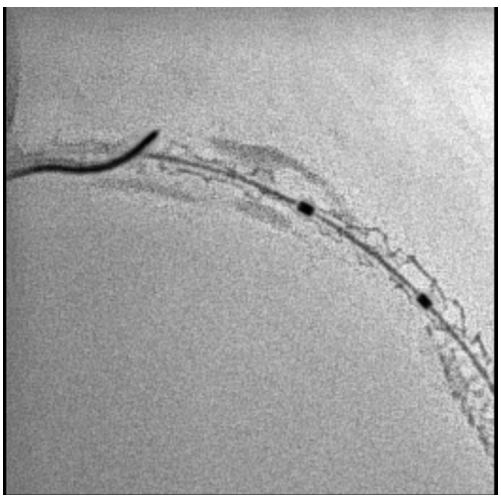
FIGURE 3 Jailed Wire Entanglement



(A) Entangled jailed wire. **(B)** Jailed wire elongation.

Subsequently, another 0.85-mm × 15-mm SC balloon was taken over the jailed wire till the deformed part and was inflated. The jailed wire—along with entire deformed stent, guide, and other wires—were withdrawn en masse from the LMCA up to the radial artery. The stent was stuck at the radial sheath tip, which was carefully and gently removed through the radial artery access site with a local incision over the skin and subcutaneous tissue (Figures 5 and 6). Subsequently, the LMCA was engaged with Judkins's left (7-F, 3.5) guide from the left common femoral artery access. Checking of the angiogram (Figure 7) and optical coherence tomography (OCT) after carefully wiring the LAD artery revealed dissection in proximal LAD with the wire in the true lumen and calcification in the proximal LAD artery (Figure 8). Subsequently, distal to proximal, the LAD artery was stented with 3-mm × 24-mm and 3.5-mm × 40-mm DES, overlapping with each other, followed by postdilatation with a 3.75-mm × 10-mm NC balloon. The final angiogram (Figure 9) and OCT run revealed well-expanded stents and insignificant intimal erosions in the LMCA (Figure 10). The patient remained stable and was discharged after 2 days.

FIGURE 4 Stent Deformation

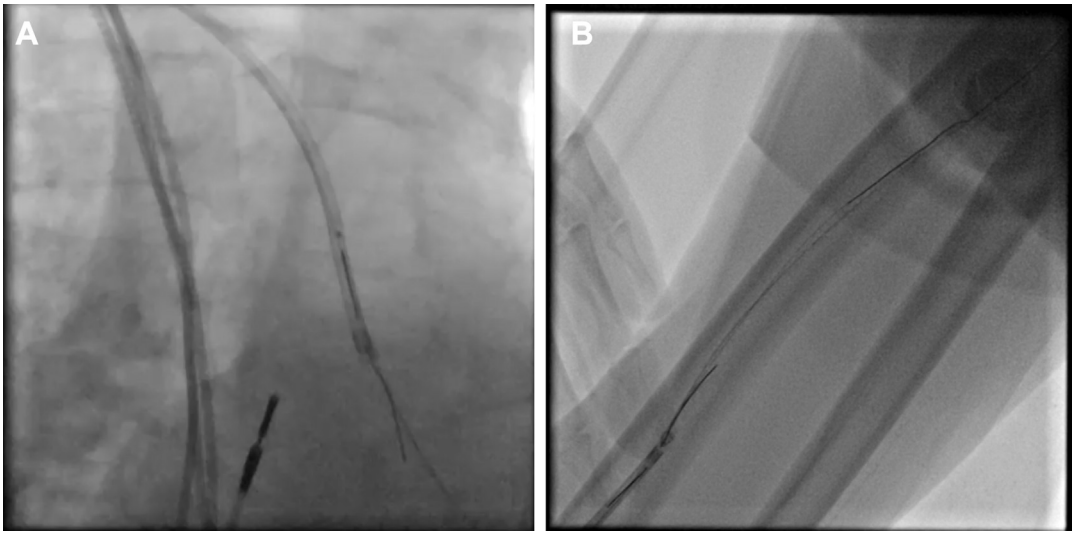


Stent boost of deformed stent.

DISCUSSION

Coronary stent deformation is a catastrophic complication of coronary intervention and is associated with major adverse cardiovascular events including myocardial infarction, stroke, and death.[3] Successful retrieval is crucial, as it is associated with a good prognosis.[6] Percutaneous retrieval can be a possible bailout option when surgical risk is prohibitive. Several percutaneous retrieval techniques using

FIGURE 5 Stent Removal



(A) Removing deformed stent. **(B)** Jailed wire with stent at the radial artery.

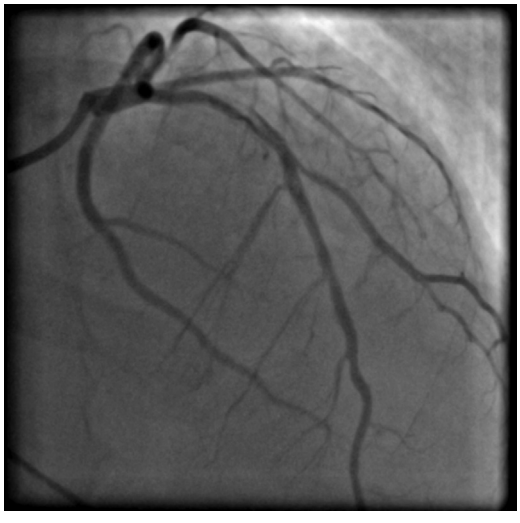
snares, wires, or balloons have previously been described.[7,8]

Risk factors for jailed wire entrapment and stent deformation include interventions in diffuse, tortuous, and calcific lesions. In our case, jailed wire entanglement with the stent must have occurred because of lack of adequate lesion preparation, use of wound wire as buddy wire, failure to remove the buddy wire before stent deployment, and the use of a long stent getting entrapped between the calcium nodule in the tortuous vessel and stent struts. Longitudinal deformation of proximal part of the deployed stent occurred because of traction on the entangled jailed wire. Excluding the deformed portion of the stent from the main lumen by crushing with another stent was not considered, as the

FIGURE 6 Deformed Stent

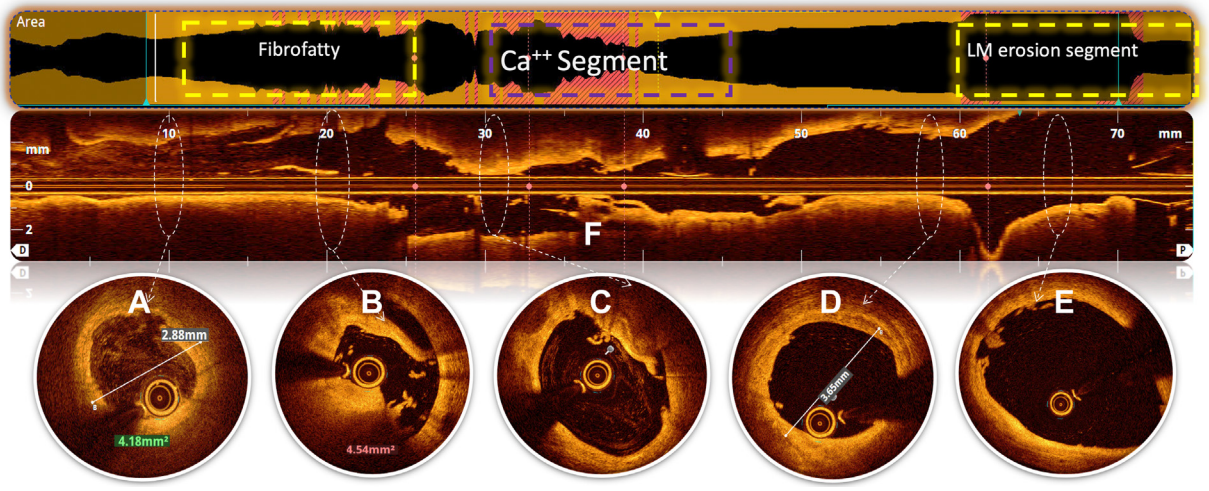
Deformed stent after extraction.

FIGURE 7 Left Anterior Descending Artery Angiogram Post-Stent Extraction



Left anterior descending artery dissection.

FIGURE 8 **OCT of LAD After Stent Extraction**



(A) Distal LAD. **(B)** Fibrofatty lesion. **(C)** Calcific lesion. **(D)** Proximal LAD. **(E)** Left main erosion. **(F)** Longitudinal view. LAD = left anterior descending artery; OCT = optical coherence tomography.

entangled jailed wire could not be completely withdrawn from the coronary lumen. In view of prohibitive surgical risk, CABG was considered as the last resort. The common stent retrieval methods as mentioned here were not feasible in our patient because of irretrievable entangled wire in the deformed stent. Hence, controlled and gentle traction on the jailed wire with an inflated balloon and withdrawal of the entire hardware en masse enabled extracting the deployed stent safely from LAD artery, even though restenosis is possible in the long run.

FIGURE 9 **Left Anterior Descending Artery Angiogram Post-Stenting**

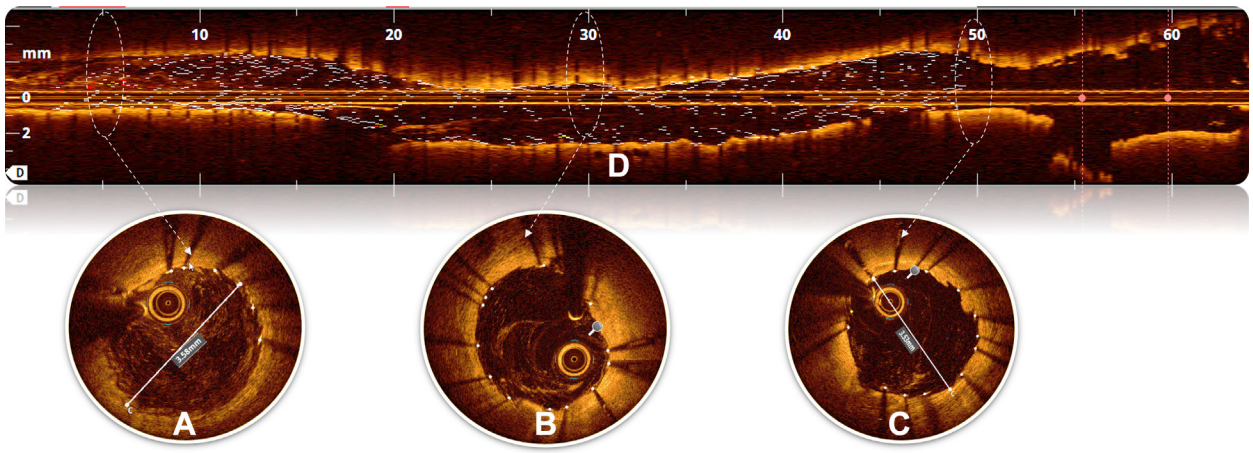
Final angiogram of left anterior descending artery.

The successful extraction of the deployed stent can be attributed to several factors. Hemodynamic stability of the patient provided adequate time to exercise various options for stent retrieval. The lumen diameter of the proximal LAD artery was slightly larger (3.65 mm) than the previously deployed stent diameter. OCT showed significant plaque burden and superficial calcium nodules in the LAD artery, suggesting possible insufficient plaque modification. These findings suggest that underexpansion and incomplete apposition of the stent—paradoxically—would have facilitated stent extraction. It was also seen that on gentle but firm manual traction, the deployed stent was not disconnected but rather elongated. As per 1 study, stents with 3 connectors tend to get elongated on attempted stretching, whereas stents with 2 connectors get broken to fragments.[3] It is fortunate that, in our case, the deployed stent was made up of more than 2 connectors in the proximal part.

FOLLOW-UP

The patient became asymptomatic with improvement in LV ejection fraction to approximately 40% after 4 weeks.

FIGURE 10 **Optical Coherence Tomography After Stent Deployment**



(A) Distal stent. **(B)** Mid-stent. **(C)** Proximal stent. **(D)** Longitudinal view.

CONCLUSIONS

Adoption of an appropriate lesion-preparation strategy in complex lesions and removing the buddy wire before stenting could have prevented this complication. Should an event occur such as that described in our case, percutaneous extraction of a deformed stent may be carefully executed in exceptional circumstances with adequate surgical backup, provided there is thorough understanding of the surrounding circumstances.

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KEY WORDS buddy wire support, complex coronary artery disease, jailed coronary wire entrapment, longitudinal coronary stent deformation, percutaneous coronary stent extraction

APPENDIX For supplemental videos, please see the online version of this paper.