A Challenging Case of Rare Stent Device Complication During STE-ACS Intervention

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Abstract

Percutaneous coronary intervention (PCI) for ST-segment elevation acute coronary syndrome (STE-ACS) is a well-established, evidence-based treatment modality that significantly improves patient outcomes when performed in a timely manner. However, in such time-sensitive and high-stakes scenarios, unexpected complications require a composed and meticulous approach to ensure successful treatment completion.

In this report, we present a case of STE-ACS undergoing PCI, in which the stent failed to expand and deploy at the target lesion following plain old balloon angioplasty (POBA). Through a series of careful maneuvers, the medical team successfully retrieved the malfunctioning balloon and stent system and subsequently implanted a new stent, achieving optimal revascularization. A subsequent thorough examination of the retrieved equipment revealed the underlying cause of the complication, leading to the development of a standardized protocol for managing similar situations in the future. Clinicians should remain vigilant for equipment malfunction during primary PCI and be prepared to implement a systematic retrieval and rescue protocol when necessary.

Keywords: STE-ACS, stent device, complication

Introduction

Percutaneous coronary intervention (PCI) is a well-established, evidence-based treatment for ST-elevation acute coronary syndrome (STE-ACS), with timely intervention significantly improving patient outcomes.[1] However, despite its efficacy, rare but critical complications may arise during the procedure, necessitating immediate and skillful management. Among these complications, device-related failures — such as guidewire fracture, stent balloon system rupture, and stent loss — pose significant procedural challenges. Stent loss and retention within the coronary vasculature or elsewhere in the patient's body can lead to severe consequences, including thrombotic complications, vessel occlusion, and an increased risk of major adverse cardiac

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events.[2-4] The incidence and management of stent loss have been well-documented, with strategies such as balloon-assisted retrieval and the use of snares to extract retained coronary hardware.[3,5] Similarly, guidewire entrapment and fracture can complicate PCI procedures, requiring specialized retrieval techniques to mitigate further vessel injury.[6] Furthermore, coronary stent fractures, although rare, have been described and can contribute to in-stent restenosis or thrombosis, highlighting the importance of early recognition and intervention.[7] Several interventional strategies have been described for the retrieval of retained coronary hardware. These include balloon-assisted stent retrieval, in which a new balloon is inflated to secure the dislodged stent before withdrawing it, as well as the use of a snare device to grasp and extract the foreign body.[3,5] Mastery of these techniques is crucial for interventional cardiologists to promptly and safely resolve such complications, while minimizing procedural risk and optimizing patient outcomes. This case report presents a rare instance of balloon shaft rupture during primary PCI and showcases the practical decision-making and technical skills required to manage such an unforeseen challenge, offering unique educational value for operators facing similar device-related emergencies.

Case Report

A 59-year-old male patient with a history of smoking, mitral valve infective endocarditis status post mitral valve repair and replacement surgery several years prior, and aortic stenosis, presented to our hospital with acute-onset chest tightness.

Upon arrival at the emergency department, electrocardiography revealed ST-segment elevation in the lead aVR and the anterior leads. After thorough discussion with the patient and after obtaining informed consent, an emergency coronary angiography was promptly performed by the interventional cardiology team.

Coronary Angiography and Initial Intervention

Vascular access was established via the right radial artery using a 6-French sheath. Coronary angiography showed no significant abnormalities in the right coronary artery; however, we observed complete thrombotic occlusion in the mid-left anterior descending artery (LAD) (Figure 1). Thromboembolism was suspected as the underlying etiology. We performed a thrombosuction procedure, resulting in significant improvement in coronary flow. Subsequently, we performed POBA using a 3.0 × 26 mm balloon. We then prepared to deploy a 4.0 × 28 mm bare-metal stent (BMS). However, at this critical juncture, we encountered an unexpected complication.

Complication: Stent Deployment Failure

During inflation, we observed that the inflator pressure did not rise as expected, and no contrast medium leakage was noted from the balloon. The proximal and distal ends of the stent balloon exhibited slight expansion, but the balloon failed to fully expand, preventing proper stent deployment (Figure 2). Furthermore, the pressure failed to adequately transmit to the balloon, rendering the stent unusable.

To address this issue, we implemented a stepwise strategy determined by the feasibility and risk of each approach, escalating to the next step only if the prior attempt was unsuccessful (Figure 3).

Stepwise Management Strategy

1. Replace the malfunctioning balloon and attempt to deploy the stent again.
2. Withdraw the balloon-stent system into the guiding catheter and remove it from the patient.
3. Withdraw the balloon-stent system into the arterial sheath and remove it from the patient.
4. Use a snare device to retrieve the stent via a larger femoral arterial sheath.
5. Consult a cardiovascular surgeon for surgical removal if percutaneous retrieval fails.

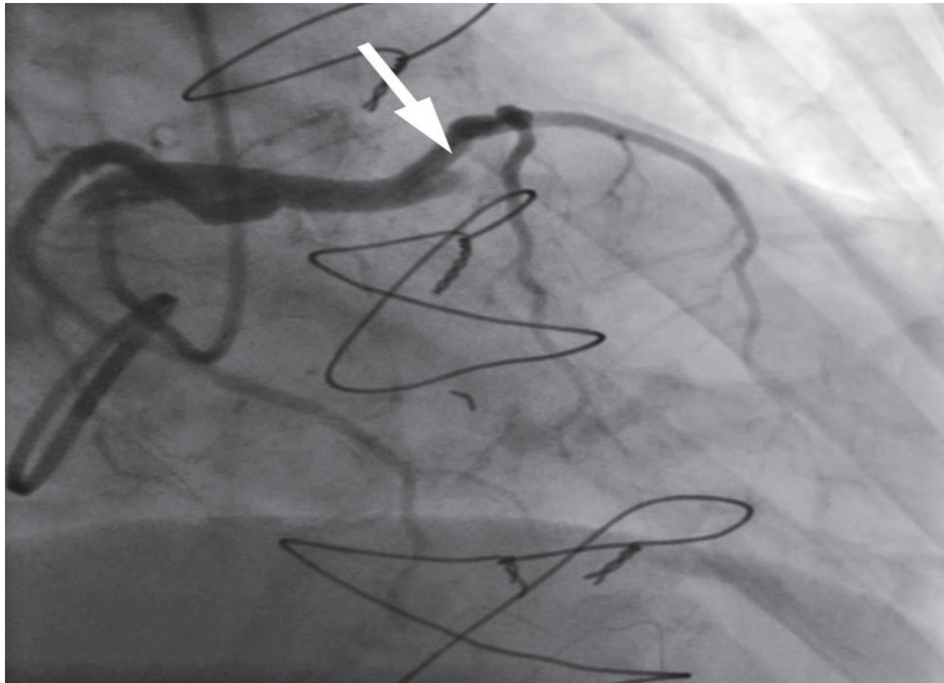

Figure 1. Complete thrombotic occlusion was observed in the mid-left anterior descending artery (White arrow).

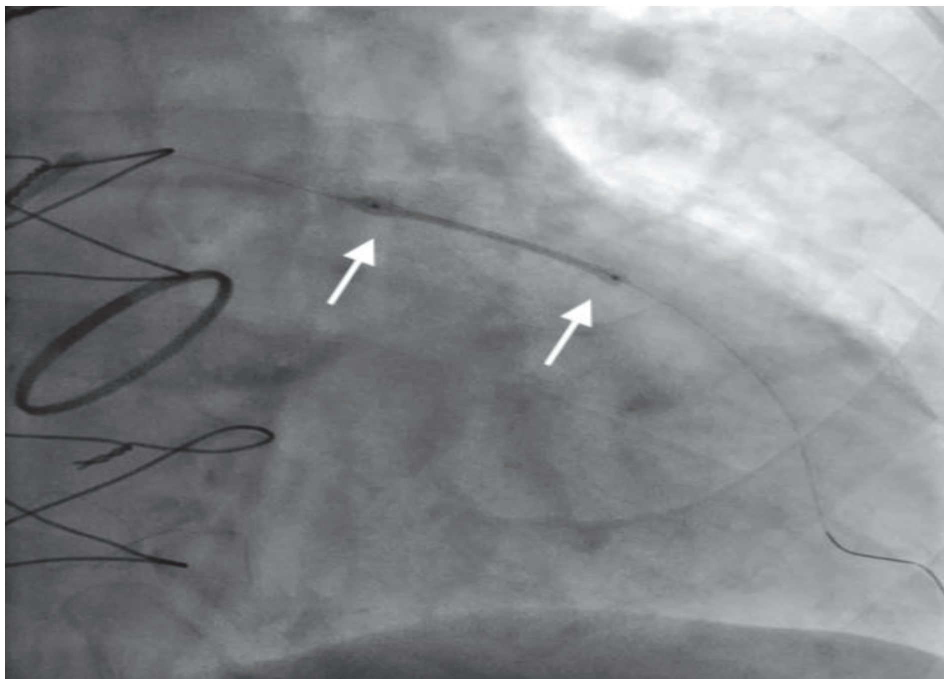

Figure 2. The proximal and distal ends of the stent and balloon exhibited slight expansion (White arrows).

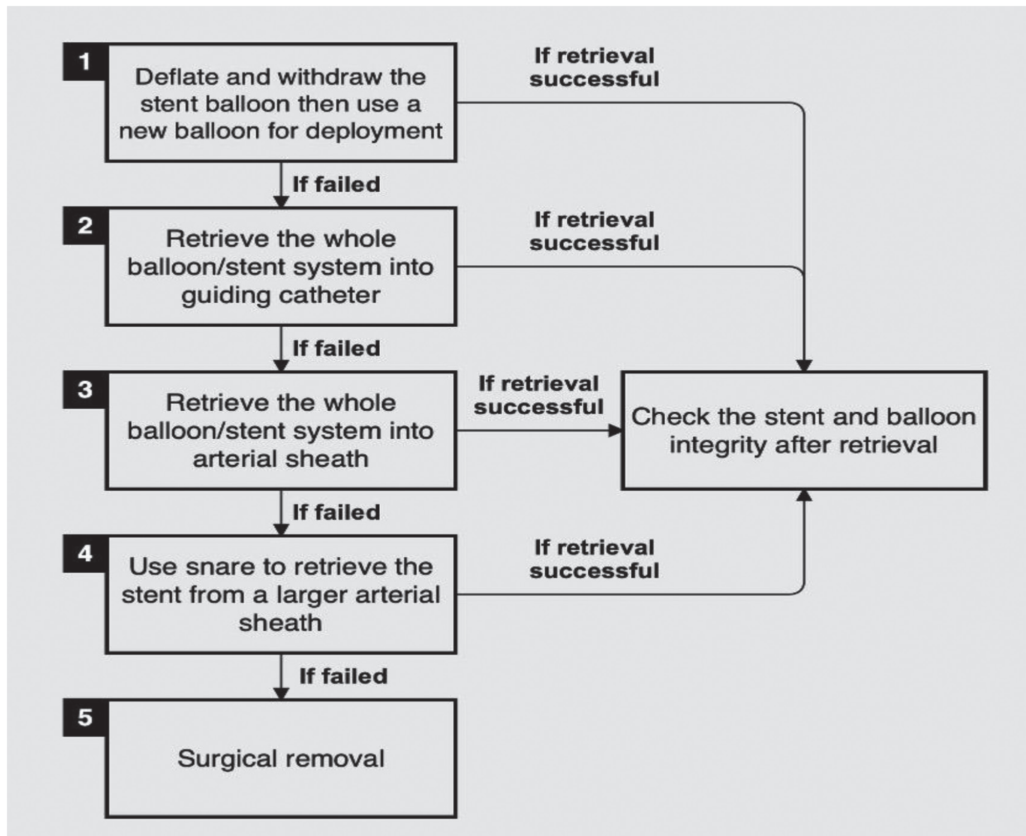

Figure 3. A stepwise strategy determined by the feasibility and risk of each approach for retrieval of the stent.

Stepwise Execution and Resolution

Step 1: Attempting Balloon Exchange.

The initial approach was to deflate and withdraw the stent balloon, replace the malfunctioning balloon, and attempt redeployment of the stent. However, we were unable to fully deflate and withdraw the balloon from the stent. This led us to suspect a rupture in the balloon shaft, which impaired pressure transmission and prevented proper deflation. Additionally, as we attempted to pull back the balloon, the stent moved along with it, indicating that the balloon was at least partially attached to the stent.

Step 2: Withdrawing the Balloon-Stent System into the Guiding Catheter.

We proceeded to withdraw the entire balloon-stent system into the guiding catheter. We successfully retracted the stent from the LAD into the aorta along with the balloon system. However, it could not be further withdrawn into the guiding catheter, as it became lodged at the distal end of the guiding catheter (Figure 4). At this stage, the stent remained crimped onto the balloon.

Step 3: Withdrawing the Balloon-Stent System into the Arterial Sheath.

We then attempted to retrieve the system through the right radial artery sheath. We successfully maneuvered the stent towards the radial sheath, but the patient experienced severe pain, suggesting increased resistance or potential vascular trauma. Furthermore, the stent could not be advanced into the sheath and became dislodged from the balloon. As the balloon was withdrawn, it detached from the stent, leaving the stent positioned along the guidewire (Figure 5).

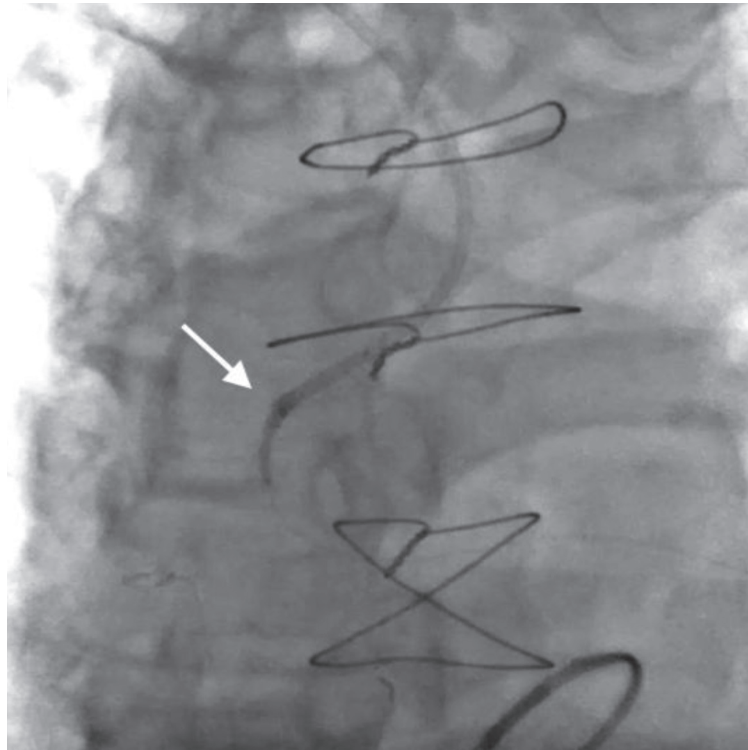

Figure 4. The stent lodged at the distal end of the guiding catheter (White arrow).

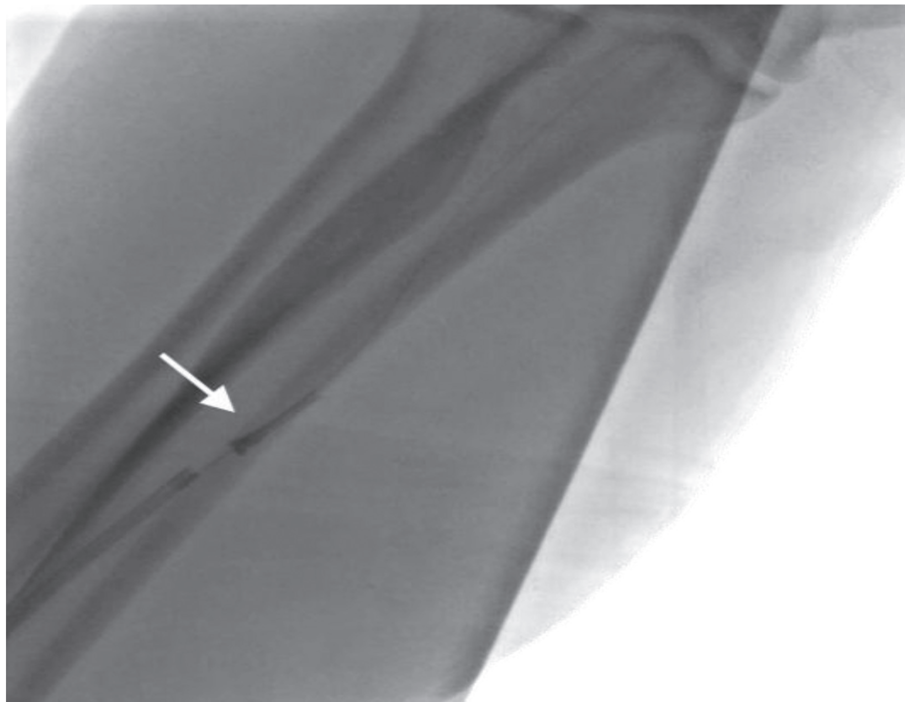

Figure 5. The stent could not be advanced into the sheath and was left positioned over the wire (White arrow).

Step 4: Using a Snare Device to Retrieve the Stent.

At this stage, we employed a retrieval strategy using a snare device. Our plan involved using a guiding catheter and a new balloon to secure the stent and maneuver it into the descending aorta (Figure 6). Subsequently, a snare device introduced through the femoral artery would be used to capture and extract the stent.

We carefully advanced the guidewire into the descending aorta to facilitate the retrieval process. Using a guiding catheter and a 2.0 mm balloon, we maneuvered the stent along the wire into the aorta, ensuring it remained secured in position (Figure 7). To enable successful extraction, we inserted an 8-French femoral sheath into the right femoral artery, through which a 10-mm snare was introduced, and carefully manipulated the snare to capture both the stent and the wire, allowing for controlled retrieval (Figure 8). Once securely grasped, the stent was gently withdrawn through the femoral sheath and successfully removed from the patient's body without further complications (Figure 9). Following stent retrieval, repeat coronary angiography confirmed that, despite the complication, there was no evidence of vessel injury, dissection, or thrombosis. We successfully deployed a new 4.0-mm BMS at the intended lesion site (Figure 10), whereupon the reconstructed blood flow was satisfactory (Figure 11). The patient recovered uneventfully and was discharged without further complications. At six-month follow-up, repeat coronary angiography showed no evidence of restenosis in the previously treated segment.

Post-Procedural Analysis

After ensuring the patient's safety, we conducted a thorough review of the incident. Examination of the retrieved equipment revealed a rupture in the balloon shaft, which prevented proper inflation and pressure transmission from the inflator to the stent balloon. We also observed continuous contrast leakage from the rupture site, confirming the mechanical failure (Figure 12). Furthermore, the stent had become partially

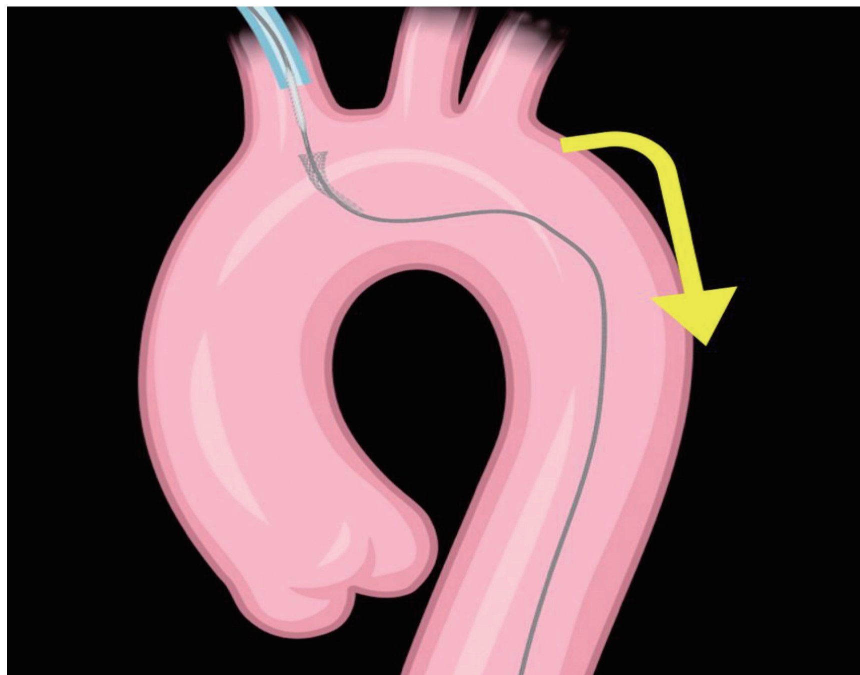

Figure 6. Cartoon graph of our plan using a guiding catheter and a new balloon to secure the stent and maneuver it into the descending aorta.

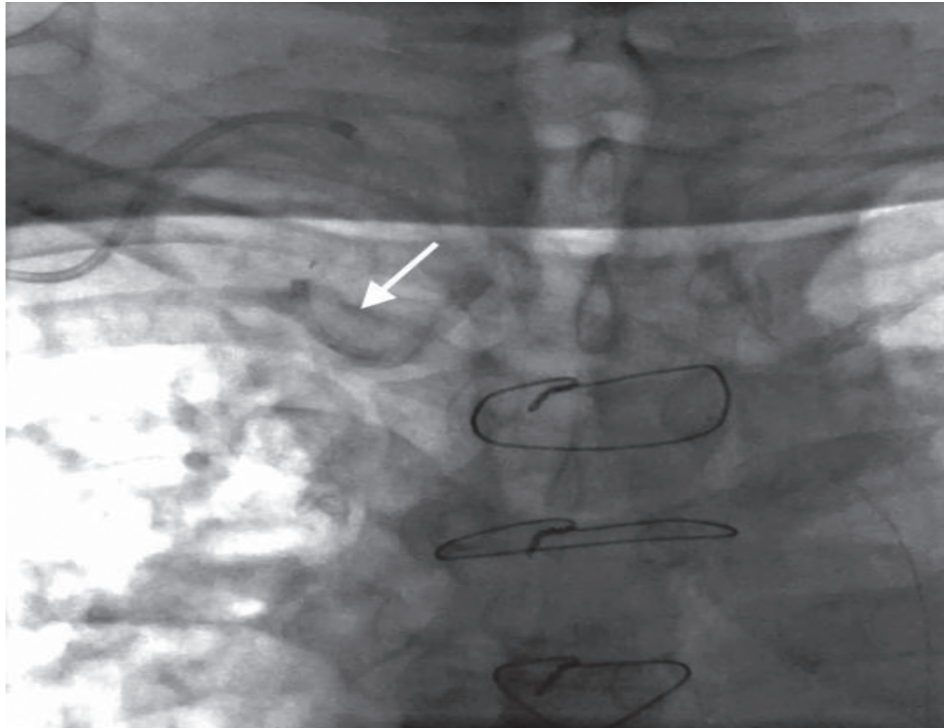

Figure 7. The stent was maneuvered along the wire into the aorta (White arrow).

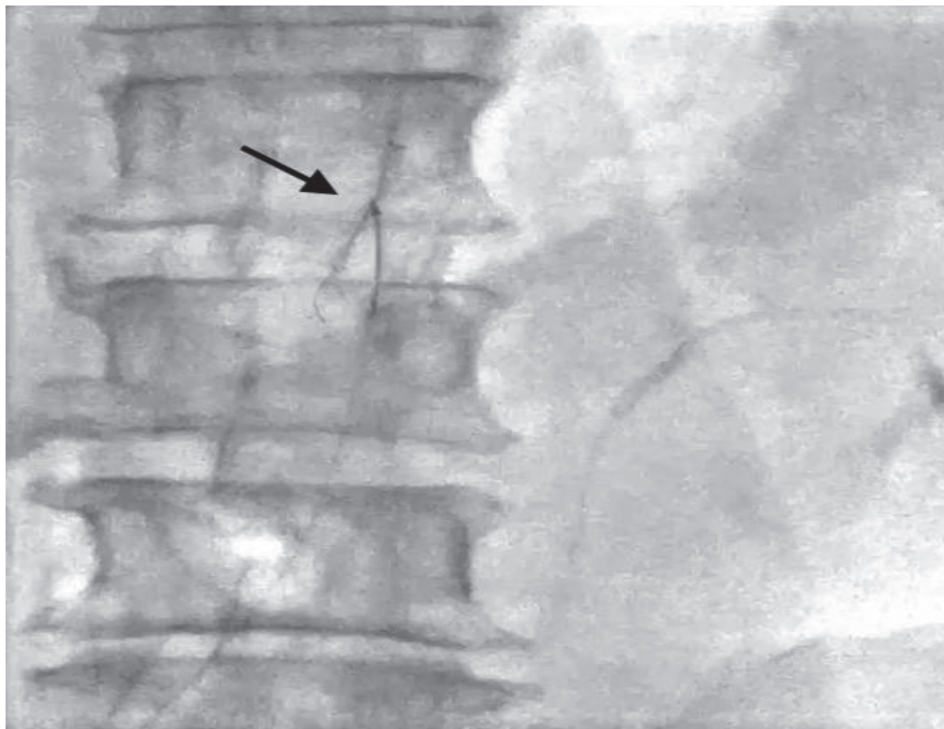

Figure 8. The snare was carefully manipulated to capture both the stent and the wire (Black arrow).

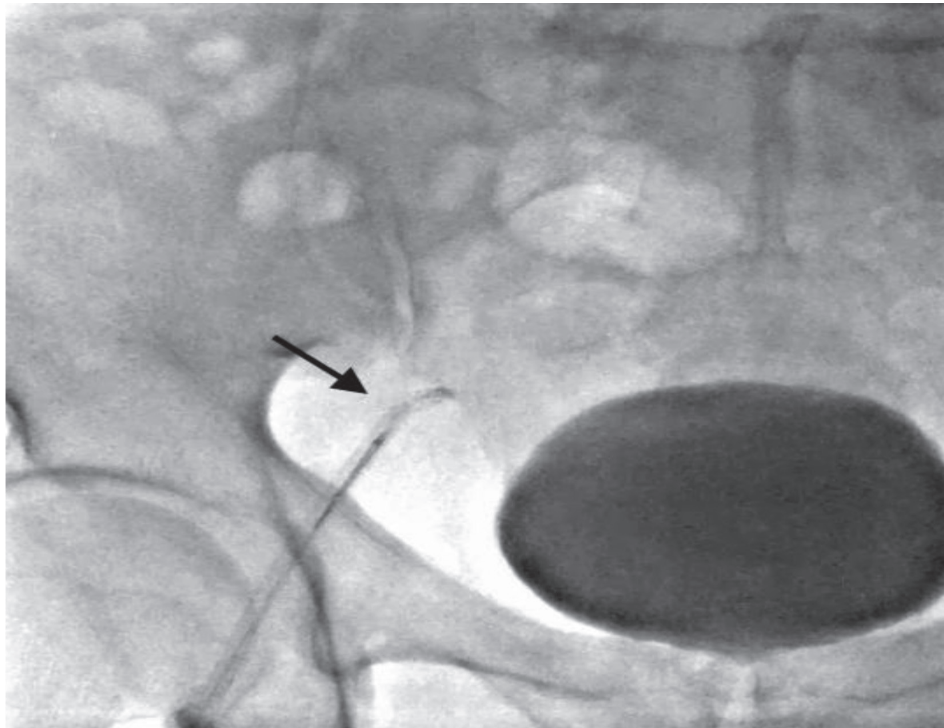

Figure 9. The stent was gently withdrawn through the femoral sheath and successfully removed from the patient (Black arrow).

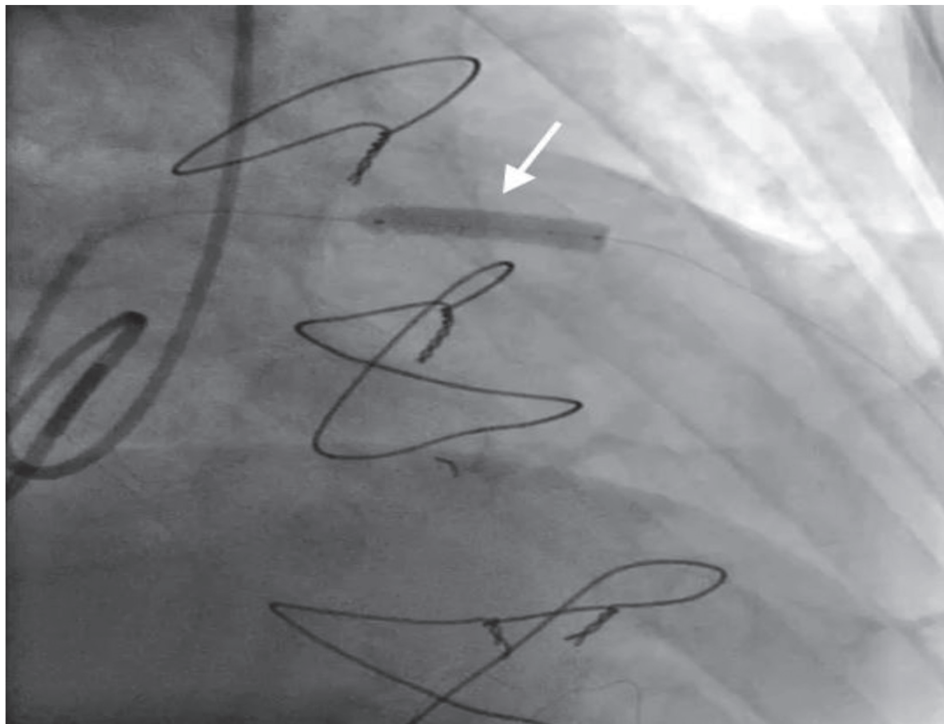

Figure 10. A new 4.0-mm BMS was deployed successfully at the intended lesion site (White arrow).

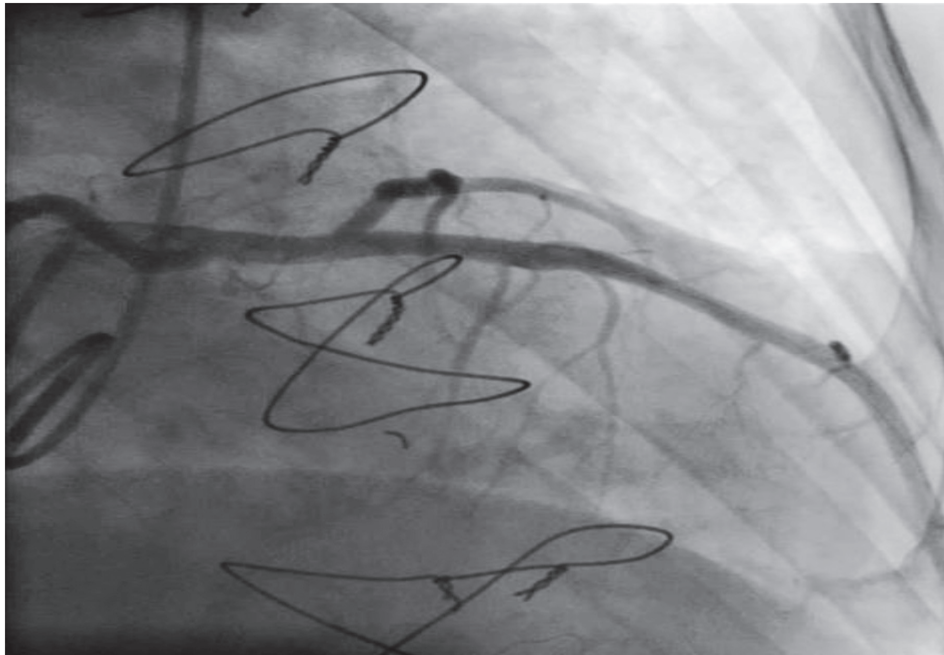

Figure 11. Final angiography.

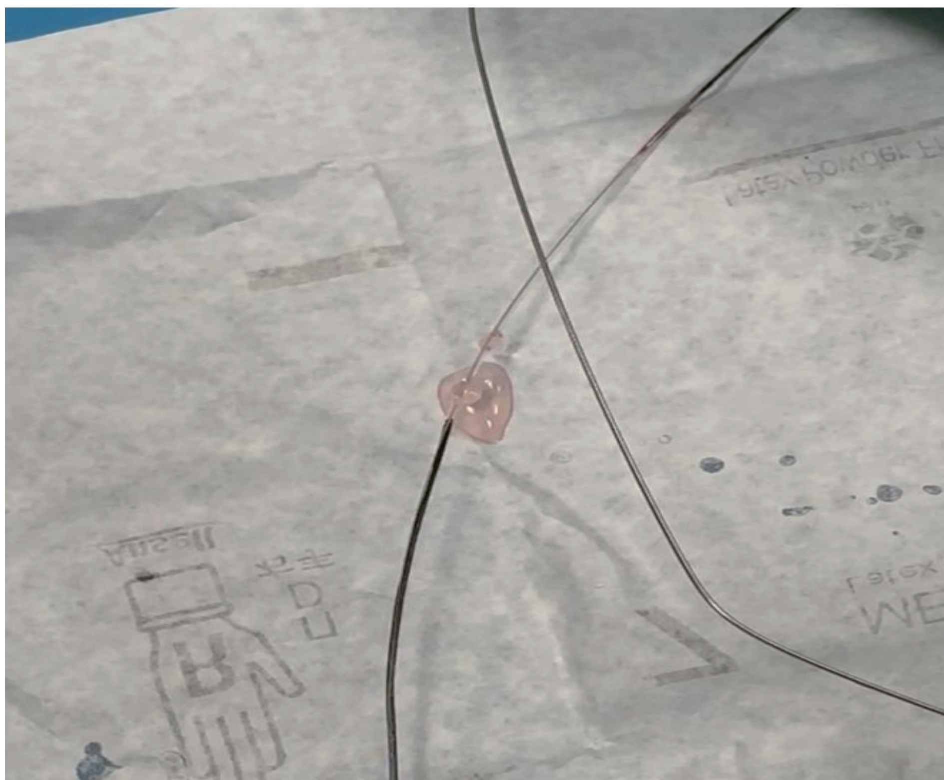

Figure 12. Continuous contrast leakage from the rupture site was observed, confirming the mechanical failure.

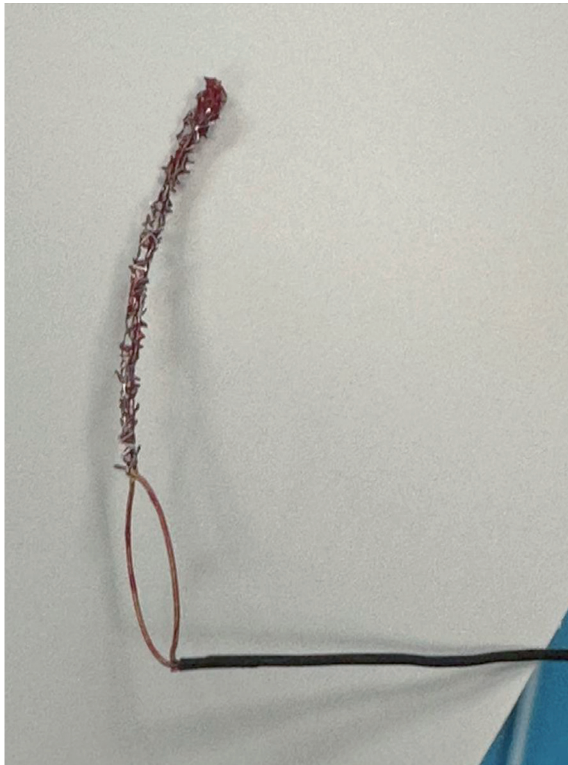

Figure 13. The stent had become partially deformed with sharp edges.

deformed with sharp edges, posing a significant risk of vascular injury if withdrawn through an inadequately sized vessel (Figure 13). This incident highlights the importance of preemptive troubleshooting, careful assessment of equipment integrity, and familiarity with bailout techniques in interventional cardiology.

Conclusion

Although rare, complications involving stent balloons, including balloon shaft rupture, can occur during percutaneous coronary intervention. To our knowledge, this specific form of device failure — balloon shaft rupture without complete fracture — is extremely uncommon. While several case reports have described complications involving the stent delivery system, most notably stent shaft fracture, they differ in mechanism from the balloon rupture encountered in our case. For example, Chen et al. reported a case of stent delivery system fracture during PCI, which was successfully managed using the trapping balloon method.[8] Similarly, Hammani et al. described a fractured stent delivery system leading to ventricular fibrillation, also resolved by the same technique.[9]

Therefore, a thorough understanding of the equipment and familiarity with appropriate bailout techniques are essential for effective complication management. Maintaining constant awareness of wire positioning is critical to prevent additional procedural challenges. When attempting to retrieve foreign objects, the use of a larger sheath is often preferable, as it facilitates smoother extraction while minimizing vascular trauma. For the event that all percutaneous strategies fail, early consultation with cardiovascular surgeons and preparedness for emergency intervention remains a necessary and effective course of action. In our case, the successful resolution of this rare complication highlights the critical importance of structured management strategies, prompt troubleshooting, and advanced technical preparedness in contemporary interventional cardiology practice. Most importantly, when faced with such complications, maintaining composure and employing a meticulous, controlled approach is key to ensuring patient safety and procedural success.

This case adds to the limited body of literature on stent delivery system complications by illustrating a distinct mechanism — balloon shaft rupture — and offers valuable procedural insights for interventionists facing similar rare challenges.

Abbreviations

BMS: Bare metal stent
LAD: Left anterior descending artery
PCI: Percutaneous coronary intervention
STE-ACS: ST-segment elevation acute coronary syndrome

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Figure 6 was created in BioRender and modified by Birdie Huang.

References

1. Byrne RA, Rossello X, Coughlan JJ, Barbato E, Berry C, Chieffo A, et al. 2023 ESC Guidelines for the management of acute coronary syndromes. *Eur Heart J Acute Cardiovasc Care* 2024;13(1):55-161. https://doi.org/10.1093/ehjacc/zuad107.
2. Alomar ME, Michael TT, Patel VG, Altomare CG, Rangan BV, Cipher D, et al. Stent loss and retrieval during percutaneous coronary interventions: a systematic review and meta-analysis. *J Invasive Cardiol* 2013;25(12):637-641.
3. Brilakis ES, Best PJ, Elesber AA, Barsness GW, Lennon RJ, Holmes DR, Jr., et al. Incidence, retrieval methods, and outcomes of stent loss during percutaneous coronary intervention: a large single-center experience. *Catheter Cardiovasc Interv* 2005;66(3):333-340. https://doi.org/10.1002/ccd.20449.
4. Iturbe JM, Abdel-Karim AR, Papayannis A, Mahmood A, Rangan BV, Banerjee S, et al. Frequency, treatment, and consequences of device loss and entrapment in contemporary percutaneous coronary interventions. *J Invasive Cardiol* 2012;24(5):215-221.
5. Hartzler GO, Rutherford BD, McConahay DR. Retained percutaneous transluminal coronary angioplasty equipment components and their management. *Am J Cardiol* 1987;60(16):1260-1264. https://doi.org/10.1016/0002-9149(87)90604-7.
6. Danek BA, Karatasakis A, Brilakis ES. Consequences and treatment of guidewire entrapment and fracture during percutaneous coronary intervention. *Cardiovasc Revasc Med* 2016;17(2):129-133. https://doi.org/10.1016/j.carrev.2015.12.005.
7. Chowdhury PS, Ramos RG. Images in clinical medicine. Coronary-stent fracture. *N Engl J Med* 2002;347(8):581. https://doi.org/10.1056/NEJMicm020259.
8. Wei-Tso Chen, Michael Y Chen, Ji-Hung Wang. Case Report: Stent Delivery Shaft Fracture during Percutaneous Coronary Intervention and Retrieval with Trapping Balloon Method. *Journal of Taiwan Society of Cardiovascular Interventions* 2023;14:35-39.
9. Hammami R, Ellouze T, Bahloul A, Abid L. A ruptured balloon shaft during an angioplasty. *Clin Case Rep* 2022;10(12):e6600. https://doi.org/10.1002/ccr3.6600.