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Case Report

Retrieval of broken balloon from left anterior descending artery during percutaneous coronary intervention

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A 64-year-old male patient presented to the Emergency Room (ER) of our hospital with complaints of precordial pain associated with profuse sweating for the past 8 hours. The pain was non-radiating and was postprandial hence the patient took some antacid medicines presuming it is due to indigestion, as the pain did not subside he came to the hospital to seek medical advice. He is a non-smoker and has had a history of diabetes for the past 10 years along with hypertension for the past 6 years.

On evaluation in ER, his pulse rate was 88 beats/min., regular; Blood Pressure (BP) of 140 / 86 mm of Hg in the right upper limb, and normal jugular venous pulse. A general examination did not reveal any significant abnormality. On auscultation hearts, sounds were normal S1, and S2 and no added murmurs were heard. The respiratory system revealed normal vesicular breath sounds. There were no signs of cardiac failure. Electrocardiography (ECG) revealed ST elevation in anterior precordial leads, suggestive of anterior wall myocardial infarction. His Troponin - T test was positive. Echocardiography revealed wall motion abnormality suggestive of hypokinetic distal septum, anterolateral & apical segment of Left Ventricle (LV) with an Ejection fraction of 50%. There was no mitral regurgitation or other sequelae of acute Myocardial Infarction (MI). His baseline biochemical reports are following- random blood sugar level of 132 mg/dl, serum glutamic-oxaloacetic transaminase (SGOT)-26 I/U, serum glutamic pyruvic transaminase (SGPT)-56 I/U, creatinine phosphokinase (CPK)-292 I/U, creatinine kinase (CK-MB)- 43 I/U, C-Reactive Protein (CRP) was negative and D-Dimer level was 0.5 ng/ml.

Other laboratory reports including complete blood counts, renal function & liver function tests were within normal range. He was administered aspirin, ticagrelor and atorvastation in the ER.

As there was doubtful history in the form of accompanying dry cough, RT-PCR COVID-19 test was sent immediately. As the patient was hemodynamically stable, it was decided to thrombolysis the patient and after taking informed consent intravenous Tenecteplase was given according to the weight. Subsequently, his pain subsided and there was a significant reduction in ST-segment elevation in repeat ECG.

Once the RT PCR report for COVID-19 was negative, he was shifted from isolation to the cardiac care unit. About 8 hours after thrombolysis, he started complaining of heaviness in the chest which was not relieved by nitrates or morphine, hence Coronary Angiography (CAG) was planned with the intention to perform rescue Percutaneous Coronary Intervention (PCI). CAG revealed normal left main, Left anterior descending artery (LAD) – mid segment 80% stenosis followed by total occlusion

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at the junction of the mid and distal segment (Figure 1). The left Circumflex (LCx) & Right Coronary Arteries (RCA) were normal. PCI to LAD was planned.

The left coronary artery was hooked with a 6F EBU catheter (Cordis Corporation Florida, USA). A Balanced Middleweight (BMW) wire 0.014" (Abbott Vascular, CA, USA) was navigated through the lesions. Some maneuvering was required to navigate the distal lesion. Contrary to expectation, the lesion appeared to be hard. A 1.5 mm Clear Line semi-compliant balloon (Newtech Medical Devices, Haryana, India) was navigated through the lesion and it was dilated at 8 atm. pressure. Check angiography revealed antegrade flow of TIMI Grade III in the distal LAD (Figure 2). While withdrawing the balloon back, it got stuck at the lesion & broke at the shaft, which was inside the distal part of the guiding catheter (Figure 3). In an attempt to retrieve this, we passed another wire across the lesion and another 3 mm balloon was advanced over the wire near the tip of the guiding catheter, so as to entrap the shaft and pull out the broken shaft of the balloon. However, in this attempt balloon shaft broke further in between. A balloon with some portion of the shaft extending to the proximal LAD was left in the lumen. The 3 mm balloon was removed. The second wire was advanced across the broken balloon to the distal LAD (Figure 4). Both the wires (the wire over the broken balloon & second buddy wire, which was advanced beyond the broken balloon) were rotated at 360° with the help of torque. This helped in entangling the broken piece of balloon and the remaining shaft between two wires. The entire assembly could be withdrawn successfully. Following this, the guiding catheter was removed. The left coronary artery was hooked with a new 6F EBU catheter (Cordis Corporation Florida, USA). The lesion was crossed with a new floppy wire and both these lesions were stented successfully (Figure 5).

Figure 1: Normal left main, LAD – mid segment 80% stenosis followed by total occlusion at the junction of the mid and distal segment.

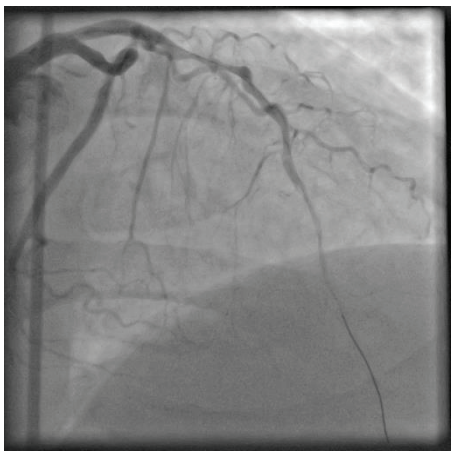

Figure 2: Check angio revealed antegrade flow of TIMI Grade IV in the distal LAD.

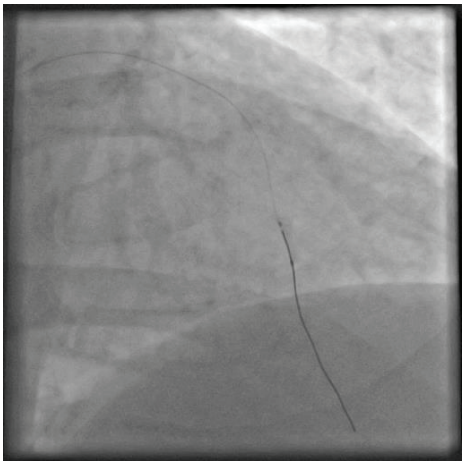

Figure 3: Balloon stuck at the lesion & broke at the shaft, which was inside the distal part of the guiding catheter.

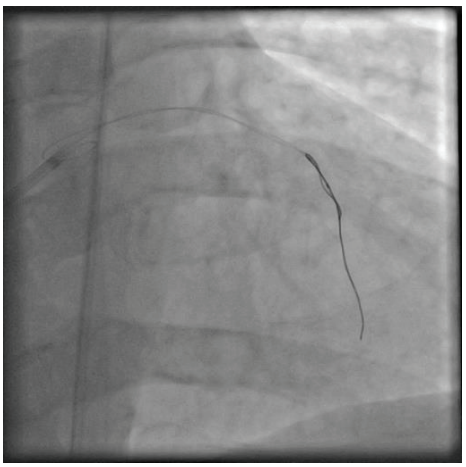

Figure 4: The second wire was advanced across the broken balloon to the distal LAD.

Discussion

Percutaneous Coronary Intervention (PCI) is safe in the majority of cases. However, hardware-related issues in the form of breakage inside a coronary artery are not uncommon. The incidence of broken or entrapped catheters, guidewires, angioplasty balloon, or stents are noted in 0.1% to 0.8% of routine cath lab procedures [1]. Of them, reports of broken balloons are even rare. Usually, the events of the broken balloon during percutaneous coronary intervention occurs due to patient-related factors viz. tortuous or calcified vessel, complex lesion; operator-related factors like inadequate pre-dilatation, excessive pushing, rapid pulling or frequent reuse of hardware; and device-related factors (i.e. manufacturing

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Figure 5: Lesion was crossed with new floppy wire and both these lesions were stented successfully.

defects). In our case, it was a slight bend in the vessel and a hard calcified lesion which was responsible for the entrapment and breakage of the shaft during withdrawal.

The removal of broken pieces of hardware is essential, as it may lead to thrombus formation, occlusion of the vessel, myocardial infarction, arrhythmia & embolic phenomenon [2].

Surgery has been the traditional treatment for retrieval of such broken hardware [3]. Over the years with a growing number of interventions, several percutaneous retrieval techniques have been in use for the retrieval of broken hardware which is based on the operator's experience, availability of hardware, and patients' condition. The commonly used percutaneous retrieval techniques include the use of paired guidewire, inflation of the balloon to entrap proximal broken segment of balloon or wire, snare devices, and use of microcatheters & biopsy forceps [4].

Girish MP, et al. reported a successful retrieval of a partially inflated balloon with a broken shaft from the coronary system by using a simple technique using a Fogarty balloon [5].

Mehta V, et al. reported successful retrieval of the impacted broken balloons by using balloon inflation in guiding catheter [5].

Kunwar, et al. [1], reported that retrieval of the ruptured balloon with the help of a buddy wire, which was inserted across the balloon, and another semi-complaint balloon was passed on the buddy wire, partially across the broken balloon which was inflated at 6 atm pressure. Then the guiding catheter was pushed inside the coronary system till it reached the broken balloon while the inflated balloon was pulled slowly which acted as an anchor. As the guide catheter reached the broken balloon, the inflated balloon was partially deflated. Due to the sudden deflation of the inserted balloon and pulling pressure, the broken balloon was sucked into the guiding catheter, which was subsequently removed by trapping the broken balloon between the outer surface of the inflated balloon and the inner surface of the guide catheter, the whole assembly was then removed.

Conclusion

In this case, our initial attempt to remove the broken shaft of the balloon by entrapping it with an inflated balloon inside the guide catheter led to further breakage on the mid-segment of the remaining shaft. The passing of buddy wire beyond the balloon and twisting the 2 wires helped us in pulling it out without causing any damage to the coronary endothelium. This case highlights the importance of an adequate dilatation of the lesion, especially in the case of the totally occluded vessel as well as deft handling of hardware specifications of the balloon, the tip of which may remain entrapped in an inadequately dilated calcified lesion.

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