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Case Report

Trapping Technique for Successful Retrieval of a Ruptured Balloon Catheter Entrapped in Coronary Artery: A Case Report

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ABSTRACT

Introduction: Device entrapment during PCI is an uncommon complication with incidence of less than 1%. Percutaneous retrieval should be favored as the treatment of choice for this condition.
Case Illustration: A 61-year-old patient came for an elective percutaneous coronary intervention (PCI) procedure. She suffered from chest pain while doing moderate activities for 1 month. Angiography showed a diffuse lesion with maximum stenosis 90% in the proximal LAD, stenosis 75% in the proximal of Left Circumflex Artery (LCx), and diffuse lesions in the proximal and mid of the Right Coronary Artery (RCA). We decided to perform PCI in the LAD. A transfemoral coronary intervention was performed using a Judkins Left 3.5 (7F) guiding catheter to engage the LAD. A Guidewire (Run-through NS Floppy) was advanced to the distal LAD. Balloon angioplasty was performed with a 2.75 x 15 mm Fluydo balloon in the proximal LAD at 16 bars, but the balloon was entrapped and while withdrawing the balloon, it accidentally ruptured in the LAD artery with the remaining segment inside the guiding catheter. A second Run-through NS Floppy Guidewire was inserted across the ruptured balloon and a 2.5 x 20 mm Fluydo Balloon was passed on the second wire and was inflated at 16 atm pressure, inside the guiding catheter, trapping the ruptured balloon. The ruptured balloon was successfully removed, by withdrawing the whole system, including the guiding catheter and the wire. Finally, we re-engaged the LAD with the same guiding catheter, passed the wire, and post dilated the stent on the LAD to achieve a good result.
Conclusion: Percutaneous retrieval using trapping technique could represent a safe and effective technique for ruptured and entrapment of a balloon-catheter in a coronary artery.

1. Introduction

Percutaneous coronary intervention (PCI) is a relatively safe procedure for the relief of ischaemic symptoms due to coronary artery disease.[1] Nowadays, complex lesions are often treated percutaneously due to technological advancement and the availability of better hardware in the form of coronary balloons and stents.

With the increasing prevalence of percutaneous coronary intervention (PCI) and complexity of lesion, even rare complications such as hardware-related complications such as stent fracture, broken coronary balloons, guidewires, guiding catheter, and other hardware, are increasingly reported and becoming a serious problem.[2,3] Various non-surgical procedures have been proposed for the retrieval of broken hardware in the PCI procedure.[3]

2. Case Presentation

A 61-year-old female patient came for an elective percutaneous coronary intervention (PCI) procedure. She suffered from chest pain while doing moderate activities for 1 month. Her risk factors were hypertension and menopause. The electrocardiogram showed sinus rhythm with T inversion in V2-V6. Her angiography result showed a diffuse lesion with maximum stenosis 90% in the proximal LAD, stenosis 75% in the proximal of Left Circumflex Artery (LCx), and diffuse lesions in the proximal and mid of the Right Coronary Artery (RCA). We decided to perform PCI in the LAD. A transfemoral coronary intervention was performed using a Judkins Left 3.5 (7F) guiding catheter to engage the LAD. A Guidewire (Run-through NS Floppy) was advanced to the distal LAD. Balloon angioplasty was performed with a 2.75 x 15 mm Fluydo balloon in the proximal LAD at 16 bars. The balloon was partially inflated and entrapped in the tight lesion. While

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trying to withdraw the balloon as we pulled with a little bit more force, the balloon accidentally rupture. Angiographic imaging revealed that the broken balloon segment was entrapped in the proximal part of the LAD with the remaining segment was still inside the guiding catheter. At that time patient still in stable hemodynamic without any chest pain or ST-T changes. For retrieval of this broken balloon, a second Run-through NS Floppy Guidewire was inserted across the ruptured balloon. Under fluoroscopic guidance, a second 2.5 x 20 mm Fluydo Balloon was passed on the second wire up to the tip of the guiding catheter and was inflated at 16 atm pressure, inside the guiding catheter, to completely trap the proximal end of the broken balloon. The ruptured balloon was successfully removed, by withdrawing the whole system, including the guiding catheter and the wire. Finally, we re-engaged the LAD with the same guiding catheter, passed the wire and proximal LAD was finally stented with Stent DES CRE8 3.0 x 28 and achieved a good result with TIMI flow 3. The rest of the hospital stay was uneventful, the patient was discharged in stable condition the next day.

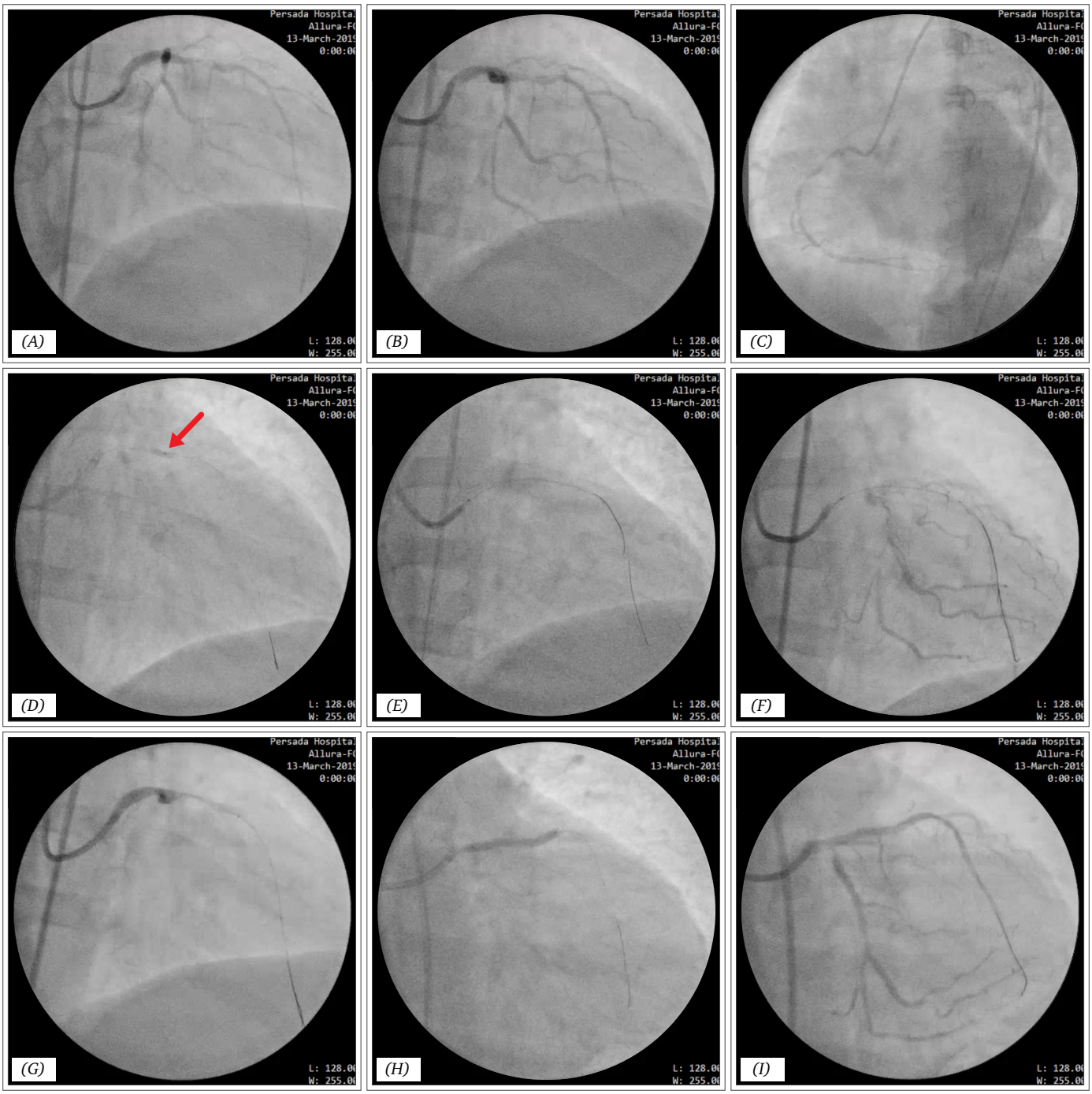

Figure 1. (A) LAD : diffuse and calcified lesion with maximum stenosis 90% in the proximal LAD; (B) LCx shows, 75% stenosis in the proximal portion; (C) RCA shows diffuse lession in the proximal to distal; (D) Red arrow show partially inflated balloon; (E) A second Guidewire was inserted across the ruptured balloon. A second balloon was inserted and inflated inside the guidig catheter; (F) The second balloon performed a gentle traction to withdraw the entrapped balloon. The entrapped balloon was pulled along side the wires and guiding catheter; (G) Stent insertion in the proximal LAD; (H) Inflation of stent in the proximal portion of LAD; (I) Final Result, TIMI Flow 3 in the LAD.

3. Discussion

Increasing application of PCI in managing complex coronary lesions has led to a rise in incidents of fracture, dislodgement, or entrapment of various angioplasty hardware. The incidence of hardware-related complications during PCI is reported at 0,1-0,8 %, within these report a broken and entrapped coronary balloon catheter is even rarer.[5] Such conditions require immediate removal from the coronary system as the may portend catastrophic consequences such as thrombus formation, acute embolization and myocardial infarction, and sudden death.[6] While cardiothoracic surgical procedure is considered as the last resort, every effort should be made to retrieve them percutaneously with the use of snares devices, paired guidewires, balloon inflation technique, microcatheter, and biopsy forceps.[6,1]

Since there is no evidence-based optimal approach to managing these situations, in most cases, the choice of retrieval technique is typically individualized based on the condition of the patient, operator expertise, and availability of retrieval equipment. It is therefore important for an interventional cardiologist to be familiar with different retrieval strategies because breakage angioplasty hardware in the coronary vasculature can often cause panic in the cath lab even for the most experienced interventional cardiologist.[1]

Usually, the events of broken balloon during PCI occurs due to several factors such as patient-related factors (i.e., a calcified lesion with sharp edges or tortuous/ angulated vessel, complex lesion), operator-related factors (i.e., inadequate pre-dilatation, excessive pushing-pulling, frequent re-use of hardware), or device-related factors (i.e., manufacturing defects).[7]

In our case, the entrapped balloon was quickly retrieved without extensive manipulation inside the coronary lumen, thereby minimizing the risk of thrombosis and dissection. In this situation, a combination of factors likely resulted in dehiscence of the balloon shaft, including underlying calcified lesion, excessive force used to advance and pull the balloon across the lesion, inadvertent rotational torque being applied to the balloon while navigating it.

Although forceful push did result in some advancement of balloon, this also resulted in the balloon being stuck (entrapped) in such a way that gentle pulling back did not result in any movement. At this point, strong pullback resulted in complete tearing of the balloon shaft at its weakest point, i.e., at the steel–plastic junction where the monorail starts.

Balloon catheter consists of a hypodermic steel tube shaft connected to a distal portion of plastic. The separation was likely due to the inadvertent rotation and manipulation of the balloon catheter at the steel-plastic junction.[3] This means that if we still maintain the engagement of the guiding-catheter, we will have a long distal radiotransparent portion of the shaft of the balloon hanging inside the catheter, being able to remove it by the trapping technique.[8]

Procedures used to remove partially retained coronary vasculature devices include intracoronary vasodilators to alleviate spasm[9] or the passage of a second wire and balloon to dilate the area of entrapment[10], intertwining procedures and the use of snares, forceps or baskets.[11]

Previously, Mehta V et al. reported a successful retrieval of impacted broken balloon by balloon inflation in a guiding catheter.[3] Chang WT et al.[2] also described two similar cases of successful percutaneous retrieval of a ruptured coronary balloon during an emergency or elective PCI. Successful retrieval of a partially inflated balloon with a fractured shaft from the coronary vasculature was also reported by Girish MP et al[5]. They managed to retrieve the broken devices by using a simple Fogarty Balloon technique which did not involve a snare system or any other retrieval tools. Snares might have been one of the choices in dealing with this condition, but they are rigid and has poor maneuverability.[12]

In our case, since the broken balloon shaft was still on the coronary guidewire and the balloon fragment did not freely protrude into the ascending aorta, so the risk of embolization to the systemic artery was none. In a situation where the broken catheter fragment is on the coronary guidewire, all efforts should be made not to let the broken fragment slip off the guidewire. If that happens, it may become more difficult or impossible to retrieve the broken fragment.

Our technique is simple yet unique, since it allows rapid and complete retrieval of the entrapped fragment with routine PCI hardware that easily available in most cath labs, reducing the procedure's time and complexity. Also, because of the minimal manipulation required, it prevents the potential risk of dissection or large thrombus formation inside the coronary lumen.

Our case shows that the trapping technique could represent a safe and effective technique in case of fracture and entrapment of a balloon-catheter in a coronary artery. As traditional snare was not used, it was, convenient and cost-saving. Also, the technique that was demonstrated in our case has the advantage of simplicity.

4. Conclusion

Our case demonstrates that the trapping technique could represent a safe, simple, and effective technique in case of fracture and entrapment of a balloon-catheter in a coronary artery.

5. Declarations

5.1. Ethics Approval and Consent to participate
Patient has provided informed consent prior to involve in the study.

5.2. Consent for publication
Not applicable.

5.3. Availability of data and materials
Data used in our study were presented in the main text.

5.4. Competing interests
Not applicable.

5.5. Funding source
Not applicable.

5.6. Authors contributions
Idea/concept: PAK. Design: PAK. Control/supervision: BS, MSR, HM, IP. Data collection/processing: PAK. Extraction/Analysis/interpretation: PAK. Literature review: BS, MSR, HM, IP. Writing the article: PAK. Critical review: BS, MSR, HM, IP. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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References

1. Singh J, Thingnam SKS, Das D, Singh H, Sharma R, Vijayvergia R. Surgical removal of entrapped and broken percutaneous transluminal coronary angioplasty balloon catheter. Interact Cardiovasc Thorac Surg 2006;6(1):94–6.

2. Chang WT, Chen JY, Li YH, Tsai LM, Lee CH. A two-case series of entrapment of a ruptured balloon in the coronary artery: Avoidable complications and nonsurgical management. J Formos Med Assoc 2015;114(11):1135–9.

3. Mehta V, Pandit B, Trehan V. Retrieval of broken export catheter during primary angioplasty. Int J Angiol 2013;22(3):185–8.

4. Eggebrecht H, Haude M, Birgelen C von, et al. Nonsurgical retrieval of embolized coronary stents. Catheter Cardiovasc Interv 2000;51(4):432–40.

5. Percutaneous Retrieval of Entrapped Partially Inflated Broken Coronary Angioplasty Balloon by Modified Fogarty Technique | Journal of Invasive Cardiology [Internet]. [cited 2020 Jul 10];Available from: https://www.invasivecardiology.com/articles/percutaneous-retrieval-entrapped-partially-inflated-broken-coronary-angioplasty-balloon-mod.

6. Sinha SK, Razi M, Himanshu K, Aggarwal P. Balloon assisted trapping (BAT) and retrieval of fractured and impacted coronary angioplasty balloon catheter: simple solution to a complex problem. Folia Cardiol 2016.

7. Kharge J, Sreekumar P, Swamy K, Bharatha A, Ramegowda RT, Nanjappa MC. Balloon-assisted retrieval of a broken stent-delivery system. Texas Hear Inst J 2012;39(5):644–6.

8. León Jiménez J, Roa Garrido J, Camacho Freire SJ, Díaz Fernández JF. Trapping as retrieval technique to resolve a ruptured and entrapped coronary balloon catheter. Catheter Cardiovasc Interv 2017;90(5):773–6.

9. Breisblatt WM. Inflated balloon entrapped in a calcified coronary stenosis. Cathet Cardiovasc Diagn 1993;29(3):224–8.

10. Colombo A, Skinner JM. Balloon entrapment in a coronary artery: Potential serious complications of balloon rupture. Cathet Cardiovasc Diagn 1990;19(1):23–5.

11. Patil S, Ramalingam R, Kharge J, Nayak M, Manjunath CN. Case Report. J Clin DIAGNOSTIC Res 2015;9(10):OD01.

12. Mikolich JR, Hanson MW. Transcatheter retrieval of intracoronary detached angioplasty guidewire segment. Cathet Cardiovasc Diagn 1988;15(1):44–6.