

An Unusual Complication of Percutaneous Transluminal Coronary Angioplasty - Case Study of an Entrapped Coronary Angioplasty Balloon and its Management

Dolly Mathew, Shivendrran Madhurai Shanmugasundaram

Abstract: 61 years old male admitted with Acute coronary syndrome, Non ST Elevation Myocardial Infarction in outside hospital and had done coronary angiogram for him. Coronary angiogram showed LAD - D1 bifurcation disease (medina 1 - 1 - 1). PTCA was done to Left Anterior Descending Artery. Post dilation resulted in entrapment of inflated balloon resulting in stuck balloon in LAD and compromising LAD flow. Patient was referred to our hospital for further management. Patient was prepared for CABG as the balloon could not be retrieved out. As the CABG was taking some time to get the slot we proceeded with Various attempts like Snaring of Balloon, deflation of stuck balloon etc, was done which were unsuccessful. Finally LAD could be wired through the side of the stuck balloon and another NC balloon was used which plastered the stuck balloon into the arterial wall reestablishing TIMI iii flow in LAD and losing Diagonal flow. Finally LAD was stented and maintained TIMI iii flow In LAD. Post procedure patient was stable.

Keywords: Stuck Balloon, NC Balloon - Non compliant balloon, PTCA - Percutaneous transluminal coronary angioplasty.

1. Introduction

The incidence of Percutaneous coronary interventions is rising with the introduction of various sophisticated hardware. [1] With the rise of various interventions for calcific coronary lesions and complex coronary artery disease, there is a trend to increasing complications like acute stent thrombosis, coronary dissection, failure of stent balloon to inflate or deflate, Perforation with abrupt closure, and hardware malfunctions. [2] Hardware malfunctions include snapping of angioplasty balloon catheter, dislodgment of guide wire, failure of stent balloon to inflate or deflate properly or stuck balloon used for post dilation in one of the struts of the deployed stent. This may occur with any device which is subjected to various manipulations specifically in calcified arteries and complex coronary lesions where operator attempt to dilate non yielding lesions. [3]

When non surgical interventions fail to retrieve the broken hardware the only option is more invasive surgical retrieval and emergency bypass procedures to salvage the situation. [4]

2. Case Presentation

61 years male, Known case of systemic hypertension, Hypothyroidism had presented with Non ST Elevation Myocardial infarction for which Coronary angiogram was done elsewhere. Stenting was done at LAD D1 bifurcation. Post stenting, a Balloon dilation had resulted in entrapment of balloon at LAD and compromised LAD flow. Patient was referred to our institution for further management.

Patient was initially planned for CABG and Coronary angiogram was done to know the severity of lesion. Check angiogram showed inflated balloon with radiolucency in LAD extending proximally into LM [Figure 1]. Tried snaring of the soft part of the balloon, couldnot be caught even after multiple attempts. Then tried to pierce the balloon by using hard coronary wire but couldnot be done. As a part

of Bail out strategy, Using 2 x 12mm Non Compliant Trek balloon, the remnant of stuck balloon was tried Trapping, However unsuccessful. The distal part of stuck Balloon was tried snaring with the help of snare, however despite multiple attempts the procedure failed. Similarly with help of Progress 200, attempts were made to deflate and burst the Stuck balloon was done. Despite multiple attempts, the Procedure failed. LAD tried wiring with help of Runthrough NS floppy wire. Couldn't wire. Hence with help of Finecross Microcatheter, LAD wired [Figure 2]. Predilated with 1x8 mm Sapphire IIpro[at]12 atm followed by which the stuck balloon deflated. Balloon plastered to wall using NC Trek 2.5 x 12mm Balloon dilation. LAD TIMI iii flow was achieved however Diagonal flow was lost. LAD was stented with Everolimuseluting stent 2.78x38mm and TIMI iii flow was achieved [Figure 3]. Patient was stable and no periprocedural events. Patient was discharged with stable vital after 1 week of hospital observation.



Figure 1: Fluoroscopy showing LAD – D1 bifurcation stents

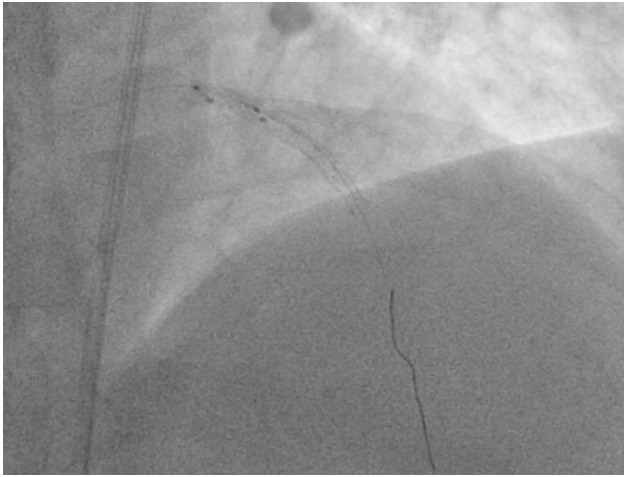


Figure 2: Decompression of the stuck balloon with NC balloon



Figure 3: Final angiogram showing LAD with TIMI iii flow

3. Discussion

The incidence of entrapped hardware during PCI is reported at a rate of only 0.4 - 1%. However entrapped hardware may lead to severe complications such as systemic thrombosis, coronary perforations and compromised distal coronary flow.^[5] The entrapment of devices occurs most often in tortuous, angulated or calcified lesions with sharp edges especially in lesions involving the proximal portion of coronary arteries^{[6] [7]}. All inflation beyond the rated burst pressures of the coronary balloon, inadequate deflations and manufacturing defects may increase the likelihood of entrapment.^[8] Some factors leading to entrapment have been reported in the literature, such as lack of backup support guiding catheters, the use of the relatively weaker 0.014 inch wire, incomplete pre - dilatation and stiffer or longer stents. Repeated usage of the hardware also can cause physical damage and entrapment.

The Possible balloon entrapment mechanisms are acute recoil of a highly calcified lesion with compression of the incompletely deflated balloon, strangulation of proximal balloon end by the guiding catheter if balloon removed before complete deflation, Break or bend in hydrotube.^[9]

The possible solutions in the case of undeflated balloon entrapment are to deflate the product, snaring it out and to burst it by over expansion^[10], to pierce it through a stiff guide wire or to cut its outer part and let it empty passively

^[11], to introduce a second guidewire and perform a buddy balloon or to transfer the patient to surgery.^[12]

Emergency surgery for retained hardware inside the heart presents unique problems of deranged hemodynamics and excessive bleeding because of loading dose of dual antiplatelet therapy along with heparinization during the procedure.^[13]

4. Conclusion

The cardiologist and cardiovascular thoracic surgeons should be aware of complications of entrapped Balloon and ready to accept these unique challenging situations. The operator should be familiar with alternative methods of retrieval of these hardware or emergency surgical interventions depending on the situation.

Source of Funding

This research did not receive any specific grant from funding agency in the public, commercial or non profit sectors.

Acknowledgement

I acknowledge entire catheterization laboratory team of the government medical college, Kozhikode for their timely intervention to tackle the situation

References

- [1] Surgical retrieval of broken, inflated angioplasty balloon catheter within intracoronary stent: A real emergency. Hemant Digambar Waikar et al. annual of cardiac anaesthesia, 2021
- [2] Singhe J, Thingnam SK, Das D, Singh H, Sharma R, Vijayvergia R. Surgical removal of entrapped and broken percutaneous transluminal coronary angioplasty balloon catheter Interactive Cardiovasc Thoraci Surg.2007; 6: 94–96
- [3] Colombo A, Skinner JM. Balloon entrapment in a coronary artery: Potential serious complication of balloon rupture Cathet Cardiovasc Diagn.1990; 19: 23–5
- [4] Yajima T, Sakakibara T, Ida T, Tsunemoto H, Ootaki E, Suzuki S. Entrapment of bro. ken guidewire in the right coronary artery during percutaneous transluminal coronary angioplasty? Nippon KyobuGeka Gakkai Zasshi.1991; 39: 1813–5
- [5] Entrapped coronary angioplasty stent balloon due to nondeflation: percutaneous retrieval by a simple technique Catheter Cardiovasc Interventions, 77 (2011), pp.58 - 61
- [6] J. L. Madronero, F. Hein, M. Bergbauer., Removal of a ruptured, detached, and entrapped angioplasty balloon after coronary stenting J Invasive Cardiol, 12 (2000), pp.102 - 104
- [7] W. M. Breisblatt Inflated balloon entrapped in a calcified coronary stenosis Cathet Cardiovasc Diagn, 29 (1993), pp.224
- [8] G. Steffenino, B. Meier, L. Finci, V. Velebit, L. von Segesser, B. Faidutti, *et al.* Acute complications of

- elective coronary angioplasty: a review of 500 consecutive procedures Br Heart J, 59 (1988), pp.151
- [9] Leibundgut G, Degen C, Riede F. Transcutaneous Puncture of an Undeplatable Coronary Angioplasty Balloon Catheter. Case Rep Cardiol.2018 Sep 3; 2018: 6252809. doi: 10.1155/2018/6252809. PMID: 30250754; PMCID: PMC6140099.
- [10] Hartzler GO, Rutherford BD, McConahay DR. Retained percutaneous transluminal coronary angioplasty equipment components and their management. Am J Cardiol.1987 Dec 1; 60 (16): 1260 - 4. doi: 10.1016/0002 - 9149 (87) 90604 - 7. PMID: 2961239.
- [11] Watt J, Khurana A, Ahmed JM, Purcell IF. Simple Solution for an Undeplatable Stent Balloon in the Left Main Stem. JACC Cardiovasc Interv.2015 Dec 21; 8 (14): e245 - 6. doi: 10.1016/j. jcin.2015.07.033. Epub 2015 Nov 18. PMID: 26604055
- [12] Desai CK, Petrasko M, Steffen K, Stys T, Stys A. Retained Coronary Balloon Requiring Emergent Open Surgical Retrieval: An Uncommon Complication Requiring Individualized Management Strategies. Methodist Debaque Cardiovasc J.2019 Jan - Mar; 15 (1): 81 - 85. doi: 10.14797/mdcj - 15 - 1 - 81. PMID: 31049154; PMCID: PMC6489603.
- [13] Yajima T, Sakakibara T, Ida T, Tsunemoto H, Ootaki E, Suzuki S. Entrapment of bro. ken guidewire in the right coronary artery during percutaneous transluminal coronary angioplasty? *Nippon KyobuGeka Gakkai Zasshi*.1991; 39: 1813-5.