

Stent Crushing as a Novel Therapeutic Option In- Stent Entrapment

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Authors' contributions

This work was carried out in collaboration among all authors. Author AK designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors RS, AB, KM and SS managed the analyses of the study. Author NOB managed the literature searches. All authors read and approved the final manuscript.

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Case Study

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ABSTRACT

Stent Entrapment is a rare complication of Percutaneous Coronary Intervention if left in situ may cause intracoronary or systemic embolization, thrombus formation, emergent coronary artery bypass graft surgery, or death. We here present a case of 2 unexpanded Drug eluting stent entrapment during the procedure leading to hemodynamic instability and its treatment using stent crushing as a life-saving procedure.

Keywords: Stent entrapment; percutaneous coronary intervention; thrombus formation; bypass graft surgery.

1. INTRODUCTION

In the 40 years since gruntzigs first angioplasty, Percutaneous coronary intervention (PCI) has

become one of the most frequently performed therapeutic interventions in medicine [1]. There has been tremendous technological advancement which has resulted in the treatment

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of increasingly complex patient populations hence despite improved device and procedural safety complications associated with PCI continue to be encountered. So it is a necessity for every interventional cardiologist to be equipped with knowledge of complications and develop skills to overcome it [2]. Intra-procedural complications during PCI can be many like Coronary dissections leading to abrupt closure thrombus formation, coronary perforations, no-reflow phenomenon and rarely stent/balloon/wire entrapment.

During complex percutaneous coronary intervention (PCI) there remains a risk of stent/balloon entrapment. [3] which is a rare but life-threatening complication of PCI, which can result in intracoronary or systemic embolization, thrombus formation, emergent coronary artery bypass graft surgery, or death. The incidence of the stent or other device loss during PCI has significantly declined in recent years, from 8.3% to 0.21%, probably due to improvements in equipment design and technology with the universal use of pre-mounted stents [3-6]. We report a case of PCI where there was entrapment of 2 Drug-eluting stents leading to patient hemodynamically instability which was subsequently treated with crushing of the entrapped stent leaving the entrapped unexpanded stent *in situ*.

2. CASE REPORT

A 54 years old hypertensive and non-diabetic female with the past history of Ischemic heart disease with PCI done 2 years back. Currently presented with significant chest pain with elevated cardiac enzymes. On examination, heart rate was 84 per minutes and blood pressure was 110/70 mm hg. Electrocardiogram revealed sinus rhythm with no significant ST-T changes. Two-dimensional echocardiography showed no regional wall motion abnormality with an Ejection fraction of 60%. The patient underwent coronary angiogram which revealed multivessel coronary artery disease i.e 60% lesion in distal left main coronary artery, instent 70% lesion in Left anterior descending artery followed by mid 70% lesion, diagonal 60-70% lesion. Osteoproximal 80% lesion in Left circumflex artery (Fig. 1) and RCA mid 80% Lesion. CABG was advised as a first line of management but on patient refusal for CABG, consent for multivessel PCI was taken. During PCI initially both LAD and LCX lesion crossed with FIELDER FC guiding wire then LM-LCX

balloon dilatation carried out f/b stenting to Mid LAD done with 3.5x 32 mm DES (Drug-Eluting Stent). Left main bifurcation was planned to be carried out by MINI CRUSH technique. 3.5 x 32 DES stent placed in LM-LCX and 4 x 32 mm DES placed in osteoproximal LAD but unfortunately during the procedure both the stent with its balloon separated leaving the uninflated balloon and stents in LM-LCX and LAD (Fig. 2).

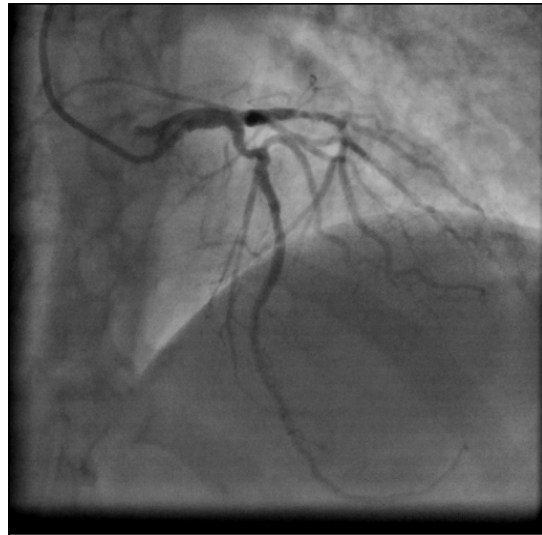


Fig. 1. Baseline left coronary angiogram (AP cranial view) showed calcified lesion in distal LM and proximal LAD, LCX

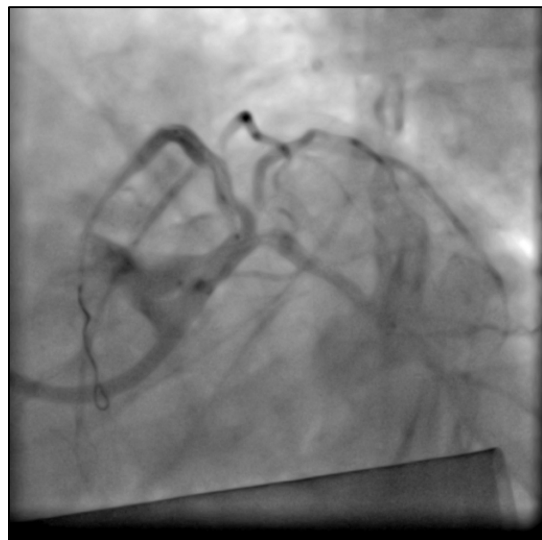


Fig. 2. Left coronary angiogram (LAO caudal view) showing entrapment of two unexpanded drug eluting stent in LM-LCX and in LAD

Pt went into cardiogenic shock and had ventricular tachycardia, VT reverted with 200 J DC shock and pt were started on Inotropic drugs. As the patient was unstable we decided to crush the unexpanded stent rather than retrieving it back. Using balloon 2.5x12 mm f/b NC balloon 3.5x12 crushing of LM and LAD stent carried out (Figs. 3,4). Osteoproximal LAD stented with 3.5x24 mm DES and LM stenting carried out with 4 x 24 mm DES (Figs. 5,6). It was decided to stage the procedure and stabilize the patient hemodynamics with LCX stenting to be carried out at a later stage. But three days later the patient developed episodes of angina with significant ST depression. Hence immediately LM – LCX PCI was carried out. The lesion in osteoproximal LCX balloon dilated with 1.2x 6 mm. Dilatation carried out further by 2.5 x 8 mm balloon (Fig. 7) and 3.5 x 12 mm DES in LM-LCX (Fig. 8). Post stent balloon dilatation carried out with NC 3.5x 15 and final kissing carried out with NC 3.5x 12 in LM-LCX and LAD stent (Fig. 9) TIMI III flow obtained.

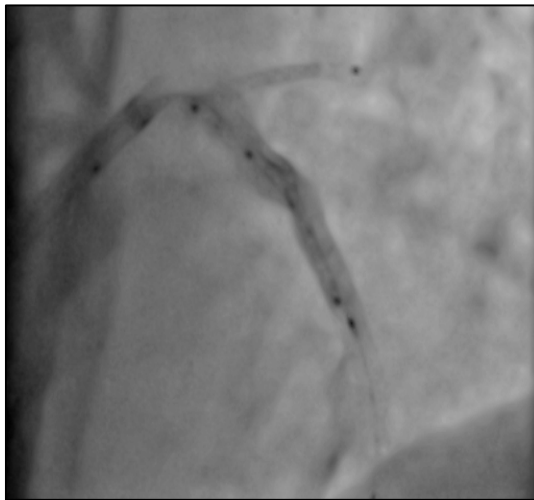


Fig. 3. Left coronary angiogram (AP cranial View): Crushing of LAD stent using compliant and non compliant balloon

PTCA to RCA was carried out after two months during which the Left system angiogram showed TIM III flow with no evidence of thrombosis/flap/dissection (Fig. 10). Pt was discharged and is on regular follow up with no fresh cardiac complaints.

3. DISCUSSION

The incidence of the stent or other device loss during PCI has significantly declined in recent years, probably due to improvements in

equipment design, technology and universal use of pre-mounted stents [4,5]. Stents were the most commonly lost devices and nowadays stent loss incidence is as low as 0.21% [5]. The common cause of stent loss attempts to deliver a stent through a previously deployed stent [5,7,8] or when the stent-balloon assembly was pulled back into the guiding catheter before the target lesion [3,4]. Poor support of the guiding catheter or guidewire, vessel tortuosity proximal to the lesion or severe vessel calcification and long stent [3,5]. In our case, both LAD, LCX was calcified and LAD was previously stented.

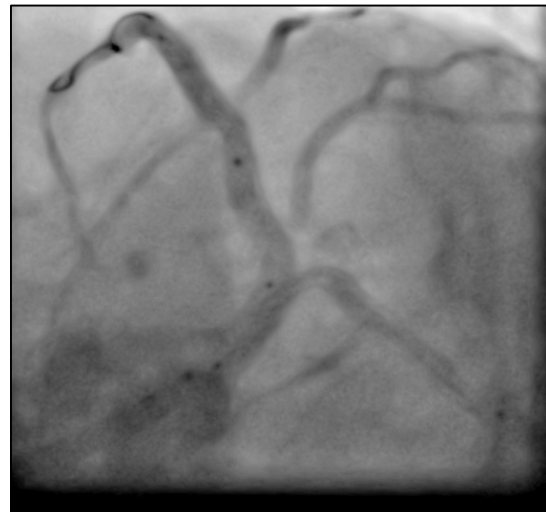


Fig. 4. Left coronary angiogram (LAO caudal view): Crushing of LAD stent using compliant and non compliant balloon

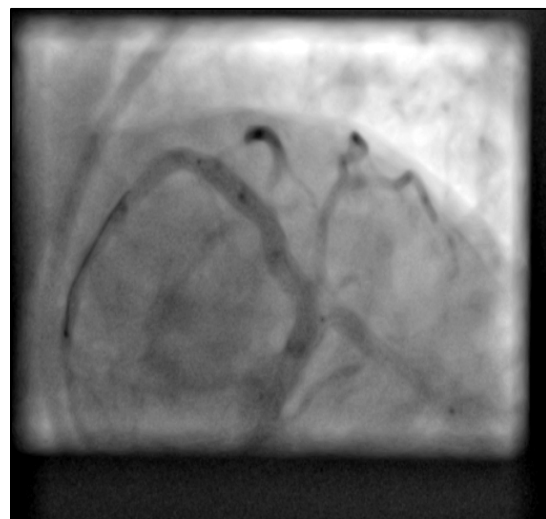


Fig. 5. Left coronary angiogram (LAO caudal view): Stenting of LM LAD done by crushing under-expanded stent



Fig. 6. Left coronary angiogram (AP cranial view): Stenting of LM LAD done by crushing under-expanded stent

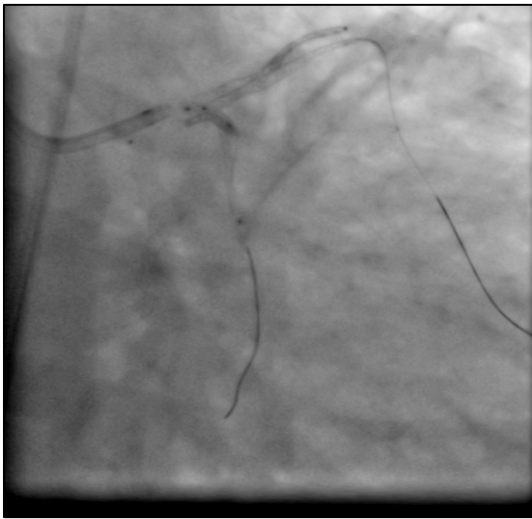


Fig. 7. Left coronary angiogram (RAO-caudal view) balloon dilatation of LM-LCX

An Unexpanded stent if left in situ may cause intracoronary or systemic embolization, thrombus formation, emergent coronary artery bypass graft surgery, or death [3,4,2]. Several techniques for retrieval of unexpanded stents from the coronary artery have been described with a success rate as high as 86%, including use of balloon catheters (inflation within or distal to the lost stent), myocardial biopsy and biliary forceps, two twisted guide wires, basket devices, and loop snares; nevertheless, surgical removal is required in a few cases [9,10,2]. In our case, pt was unstable so it was difficult to go for retrieval

techniques which are tedious and time-consuming hence we proceeded with crushing the under-expanded stent with another stent. Meticulous attention should be given to completely apposing the stent struts with the vessel wall to avoid the limitation of blood flow through the coronary artery. The present case demonstrates that the technique of crushing an undeployed stent is remarkably easier and faster than several tedious stent retrieval techniques. It could be used safely and effectively in preference to several challenging stent retrieval techniques especially in unstable patients [11,12,13].

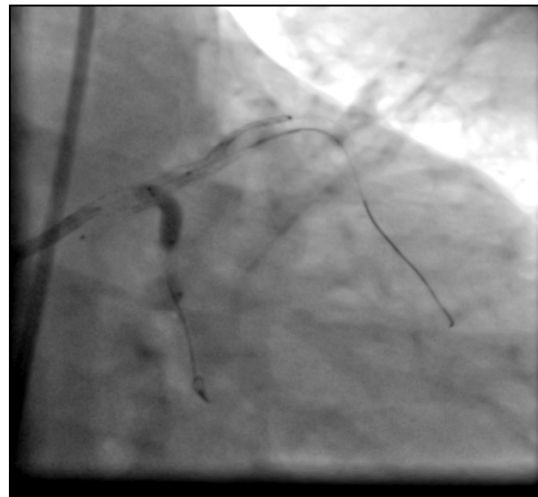


Fig. 8. Left coronary angiogram (RAO-caudal view) stenting of LM-LCX

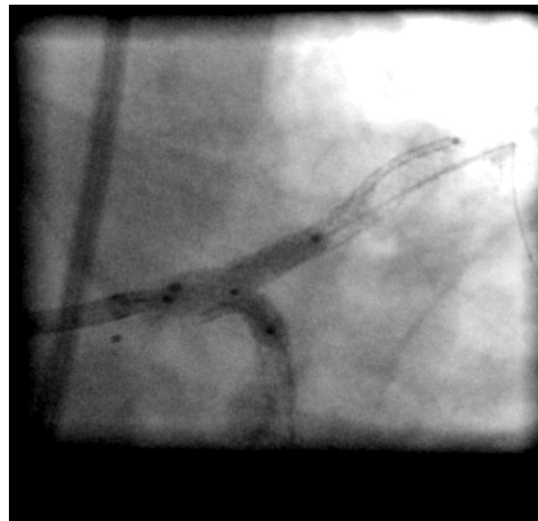


Fig. 9. Left coronary angiogram: final post stent kissing balloon dilatation of LM- LAD and LM LCX stent



Fig. 10. Left coronary angiogram after 2 month post procedure

4. CONCLUSION

Stent Entrapment during coronary intervention is an uncommon but dreadful complication. Stent crushing by a DES can be done in unstable patient especially if it is not retrievable.

CONSENT

As per international standard, patient's written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard written ethical approval has been collected and preserved by the author(s).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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