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EDITORIAL

Recognizing and preventing complications regarding bioresorbable scaffolds during coronary interventions

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Abstract

The evolution of coronary intervention techniques and equipment has led to more sophisticated procedures for the treatment of highly complex lesions. However, as a result, the risk of complications has increased, which are mostly iatrogenic and often include equipment failure. Stent dislodgement warrants vigilance for the early diagnosis and a stepwise management approach is required to either expand or retrieve the lost stent. In the era of bioresorbable scaffolds that are not radiopaque, increased caution is required. Intravascular imaging may assist in detecting the lost scaffold in cases of no visibility fluoroscopically. Adequate lesion preparation is the key to minimizing the possibility of equipment loss; however, in the case that it occurs, commercially available and improvised devices and techniques may be applied.

Key Words: Bioresorbable scaffolds; Stent dislodgement; Complication prevention; Coronary complications; Equipment failure

Core Tip: Adequate lesion preparation is key to minimizing the possibility of equipment loss with bioresorbable scaffolds; however, in the case that it occurs, commercially available and improvised devices and techniques may be applied.

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INTRODUCTION

The evolution of coronary intervention techniques and equipment has revolutionized the quality of percutaneous coronary angioplasty; however, the increase in complexity comes along with more complications, most of which are iatrogenic and preventable. Calcified lesions are the most difficult to manage and require vigilance to prevent complications, such as equipment loss. In the case report by Sun *et al*[1], we read, with interest, the successful management of such a complication with a stepwise approach using intravascular imaging and common coronary balloons. In the process of treating a calcified lesion, a bioresorbable scaffold (BRS) was dislodged from its balloon in the proximal left anterior descending artery, which was confirmed by intravascular ultrasound (IVUS). The authors managed to oppose the dislodged scaffold by crossing and inflating balloons of incremental diameter through the lost scaffold, resulting in the resolution of the index complication and treatment of the lesion.

LESION PREPARATION AND TREATMENT

The treatment of calcified or tortuous lesions requires a stepwise approach targeting plaque modification and 1 : 1 balloon pre-dilatation[2,3]. The goal is stent delivery, appropriate expansion, and apposition. However, inadequate preparation may lead to balloon/stent entrapment, failure in deflating the balloon, or stent dislodgement. In particular, stent unloading into the coronary circulation may compromise the blood flow and embolize in distal segments from which retrieval is impossible. Algorithms incorporating all available tactics have been developed and published, which are targeted at preventing harmful sequelae[4]. Furthermore, the role of intravascular imaging has been repeatedly highlighted in large clinical trials, with optical coherence tomography (OCT) and IVUS showing better clinical and procedural results in stable and acute settings[5-7]. Recently, the INVICTUS trial demonstrated the non-inferiority of OCT compared to IVUS[8].

EQUIPMENT FAILURE

Most stent dislodgements happen during an aggressive effort to cross a resistant lesion followed by pullback of the wedged stent in the lesion. Partial dislodgement, if recognized on time, can be managed by sequential inflation of the proximal part of the stent, followed by the rest of it, firstly with its balloon and then the addition of smaller balloons until full expansion. In the case of the stent being already placed in the correct target, the procedure can be completed; otherwise, more manipulations (additional stents, bifurcation techniques) may be required. However, if full unloading occurs, the primary consideration should be to not lose the wire position that runs through the lost stent. Then, if not embolized, incremental diameter balloons, starting with small balloons (0.75 mm), may be placed into the unexpanded stent to expand it to full apposition. If this is not possible, a second wire may be placed next to it, and with the help of a second and more distally partially inflated balloon, the stent may be retrieved and pulled back into the catheter. Of value are the catheter extensions that may be placed proximally to the lost stent, thus facilitating the retrieval. The easiest technique, nevertheless, is the position of two more guide wires and entrapment of the lost stent by twisting the wires, resulting in retrieval of the whole catheter–wire system "*en-bloc*"[9]. The caveat of this move is that repeat cannulation and wire crossing through a "prepared" and potentially dissected lesion is necessary. The snare approach is sometimes the only way of retrieval in cases with difficult anatomy, distal embolization, or loss/protrusion in the aorta. Commercially available snares may be used with or without the help of guide extensions[10]. The improvised use of equipment to function as snares (using long wires), alligator forceps, and other commercially available retrieval devices can be used based on the availability of each catheter lab[11-14]. Crushing the stent on the intima by expanding a second stent is the last transcatheter resort; however, it is not an option for proximal vessel parts, bifurcations, and the left main artery. Surgical retrieval may be required if all the above fail.

The situation is more complicated when a BRS is dislodged. The interest in the BRS has returned with the development of next-generation metallic scaffolds, with the magnesium alloy ones being the main representatives in large clinical trials [15,16]. The problem is the limited visibility of the scaffold, which is often imaged by intravascular imaging or by identifying the proximal and distal radiopaque markers. The markers of newer scaffold generations are more visible by fluoroscopy, facilitating the detection and placement[17]. All the above-mentioned techniques may be used for BRS, except for the crush technique. Crushing and entrapping a BRS has not been published before and there is no previous experience. The most important consideration is the potential interference with scaffold resorption and if resorbed completely, the void that will be created between the stent and the vessel wall. From our perspective, to understand the behavior of the extent of manipulation of BRS, trials investigating the treatment of bifurcation lesions are necessary.

CONCLUSION

As new scaffolds are being developed and enter into everyday practice, we should not only be vigilant to manage complications but adapt our techniques to the scaffold design. Intravascular imaging has a crucial role in identifying the complications and in controlling the outcomes.

FOOTNOTES

Author contributions: Latsios G was responsible for conception, writing, design, drafting, revision, and final approval; Koliastasis L was responsible for writing, drafting, revision, and final approval; Toutouzas K and Tsioufis K were responsible for writing, overall supervision, and final approval; all of the authors read and approved the final version of the manuscript to be published.

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