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Original Research Article

Emergency Surgical Management of Entrapped Guidewire and Stent in Coronary Artery

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Abstract:

The primary goal of this article is to emphasize the critical role of emergency coronary artery bypass surgery in cases involving entrapped stents and guidewires. We present two cases in which surgical intervention was required due to guidewire entrapment, necessitating both rescue and revascularization. In one case, the procedure involved the use of cardiopulmonary bypass, with the heart arrested and the aorta opened, and followed by revascularization. In contrast, the second case was managed off-pump, involving removal and revascularization without the need for cardiopulmonary bypass.

Keywords: coronary artery bypass grafting, Entrapped stent, Entrapped guidewire, surgical revascularization, Cardiopulmonary bypass, Off-pump coronary surgery.

Introduction

With advancements in technology and the rising number of coronary angiography and percutaneous coronary intervention (PCI) procedures, the associated risks of complications have also increased. While technological improvements have enhanced the safety and efficacy of these procedures, they have not entirely eradicated complications. Multiple treatment modalities exist for managing complications such as stuck or fractured hardware, yet there is no universal consensus on which technique should be employed as the first line of treatment. In many cases, percutaneous intervention techniques can successfully address these complications. However, when these methods fail, emergency surgical intervention becomes necessary to ensure patient safety and resolve the issue effectively

Case Report

Case 1: A 73-year-old female with a known history of diabetes mellitus presented with complaints of angina pain, though she remained hemodynamically stable. Given the clinical presentation, a coronary angiography (CAG) was recommended to evaluate the coronary arteries, with a plan to proceed to percutaneous coronary intervention (PCI) if significant blockages were identified. The CAG revealed substantial stenosis at the ostium of the left anterior descending (LAD) artery, prompting the need for intervention. However, during the procedure, complications occurred when the guidewire became lodged and subsequently fractured in both the proximal ramus and left main coronary artery. Multiple attempts were made to retrieve the fractured guidewire, but all efforts were unsuccessful (Figure 1). As a result, the decision was made to abandon the PCI, and the patient was immediately scheduled for coronary artery bypass grafting (CABG) surgery to address both the fractured guidewire and the coronary artery stenosis. A median sternotomy was performed to gain access to the heart. Right atrial and aortic cannulation were initiated, and the patient was placed on cardiopulmonary bypass. After achieving cardiac arrest, an aortotomy was performed, which allowed for successful retrieval of the guidewire from the left coronary ostium. Following this, CABG was carried out using the saphenous vein for grafting to the LAD and ramus arteries. The patient tolerated the surgery well and experienced no postoperative complications. She was extubated and discharged in a stable condition after a brief hospital stay. She continues to undergo regular follow-up to monitor her recovery and long-term cardiac function.

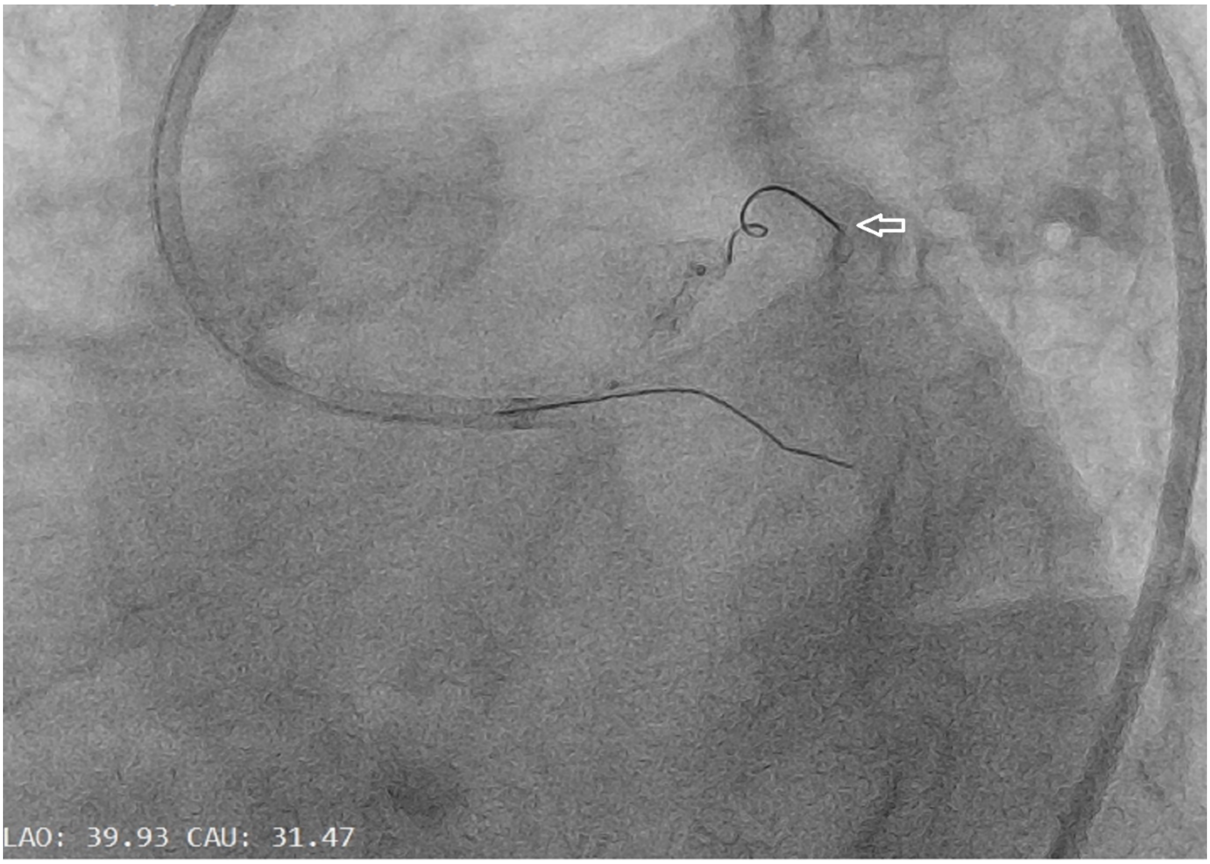

Figure 1: fractured guide wire in Left coronary artery

Figure 2: jailed wire in Right coronary artery

Case 2

A 61-year-old female patient, with a known history of diabetes mellitus and hypertension, presented with a prior episode of inferior wall myocardial infarction. A coronary angiogram (CAG) was performed, revealing the presence of triple vessel coronary artery disease. The significant involvement of multiple coronary arteries indicated the need for percutaneous coronary intervention (PCI). It was planned for PCI to be performed on the right coronary artery (RCA), followed by a staged PCI on the left anterior descending (LAD) and obtuse marginal (OM) vessels in a subsequent procedure.

During the initial PCI to the RCA, a proximal stent was successfully deployed. However, complications arose following the deployment of the distal stent. The guidewire used in the procedure became trapped against the distal stent, a complication referred to as a "jailed wire" (as seen in Figure 2). Despite several attempts to remove the guidewire, the procedure became increasingly complex, leading to an iatrogenic RCA ostial dissection. To address the dissection, another covered stent was deployed. However, this did not resolve the underlying issue of the stuck guidewire, and the distal stent became crumpled, further complicating the situation. At this stage, with the guidewire irretrievable and the stent deformed, the patient was hemodynamically stable but required immediate surgical intervention. The patient was then urgently referred for surgical retrieval of the guidewire and the crumpled stent, as well as coronary artery bypass grafting (CABG). The patient was scheduled for emergency surgery to address these complications. A midline sternotomy and pericardiotomy were performed to provide access to the heart. To minimize complications, the surgery was performed under heparinization and with an off-pump technique, which avoids the use of cardiopulmonary bypass and reduces the potential risks associated with it. First, the left anterior descending artery (LAD) was bypassed using a saphenous vein graft. Once the LAD bypass was completed, attention was turned to the right coronary artery (RCA).

A cardiac stabilizer was employed, and the distal RCA was opened before the bifurcation. Inside, the trapped guidewire, still connected to the distal stent, was visualized. The guidewire and stent had adhered to the intimal layer of the artery, which necessitated careful dissection. Using precise maneuvering techniques, the surgical team was able to free the guidewire from the arterial wall. An endarterectomy was then performed, utilizing a plaque dissector and Freer elevator to fully remove the stent and guidewire from the arteriotomy site (as depicted in Figure 3). Once the foreign material was successfully removed, the team proceeded with bypass grafting of both the obtuse marginal (OM) artery and the RCA using additional saphenous vein grafts to restore blood flow to these critical vessels.

The surgery was completed without complications, and the patient demonstrated a stable postoperative course. Recovery was uneventful, and the patient was discharged from the hospital on the fifth postoperative day in good condition. The patient is currently on regular follow-up, with ongoing monitoring to ensure the long-term success of the bypass grafts and to manage her underlying cardiovascular and metabolic conditions.

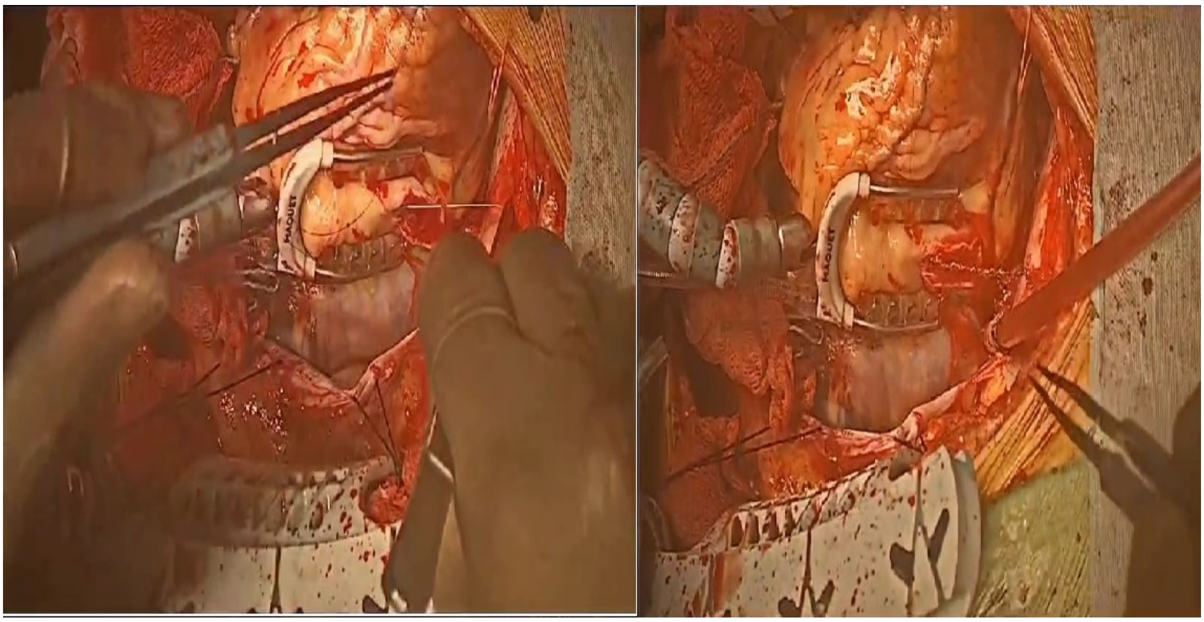

Figure 3: Removal of jailed guidewire from RCA and Stent from RCA after endarterectomy

Discussion

The phenomenon of broken guidewires in medical procedures was first documented in 1980, marking a significant concern in the field of interventional cardiology and vascular surgery. At that time, the prevailing method of treatment was surgical intervention, primarily due to the limited options available for managing such complications. Despite significant advancements in medical technology, including improved imaging techniques and the introduction of high-quality devices and wires, the frequency of guidewire-related complications has unfortunately risen. This increase can be attributed to the growing complexity of procedures performed, particularly those involving chronically occluded vessels, bifurcated lesions, and instances where acute angulation of wires occurs in side branches.

The reported incidence of guidewire-related complications during interventional procedures varies between 0.2% and 0.8%, highlighting the persistence of this issue despite improvements in technology and techniques [2,3]. Such complications can lead to significant patient morbidity, necessitating careful consideration of treatment options when they arise.

Treatment for retained and entrapped wires and stents typically involves three primary approaches: percutaneous procedures, conservative management, and surgical intervention.

1. Percutaneous Procedures: These minimally invasive techniques are often the first line of defense against retained guidewires. Tools such as snare devices, low-profile balloon catheters, and specially designed guide wires that can be twisted and maneuvered are commonly employed. These techniques are favored due to their lower associated risks compared to open surgical procedures [4-6].

2. Conservative Management: In certain cases, particularly when the patient's condition poses a higher risk than the potential benefits of removal, conservative management may be adopted. This approach may involve leaving a small remnant of the guide wire in place within side branches or chronically occluded vessels. While this strategy has been reported to be safe in select cases, it is not without risks. The presence of retained hardware within coronary vessels can act as a nidus for endothelial injury, leading to further platelet aggregation. This situation increases the risk of acute thrombosis, as retained wire fragments have the potential to cause emboli, thrombosis, vessel dissection, and even catastrophic rupture of the vessel [7].

3. Surgical Treatment: In cases where percutaneous methods are insufficient or when the complication is particularly severe, surgical intervention becomes necessary. This typically involves the removal of the retained or entrapped wire or stent, followed by revascularization of the affected coronary arteries to restore normal blood flow. Surgical techniques may vary depending on the specific circumstances surrounding the complication.

In our clinical experience with two patients exhibiting complications from retained guidewires, distinct approaches were utilized based on the specific challenges presented. In the first patient, the guide wire was lodged in the proximal segment of a coronary vessel, necessitating cardiac arrest after initiating cardiopulmonary bypass. An aortotomy was performed to access the aorta, where the guide wire was successfully removed. This was followed by a revascularization procedure to restore blood flow.

Conversely, the second patient presented a different scenario where the guide wire was trapped within a stent located in a distal vessel. Remarkably, this patient tolerated an off-pump procedure without the need for a cardiopulmonary bypass machine. In this case, both the guide wire and stent were successfully retrieved, allowing for complete revascularization of the affected area. These cases illustrate the importance of tailored treatment approaches depending on the specifics of each situation. The ongoing evolution of interventional techniques and devices remains crucial in addressing the complexities of vascular interventions while minimizing the risks associated with guidewire complications.

In summary, while the challenges posed by broken guidewires persist in contemporary medical practice, advancements in both technology and procedural techniques offer a range of solutions. A comprehensive understanding of the potential complications and available treatment options is essential for optimizing patient outcomes in interventional cardiology.

Conclusion

In conclusion we would like to emphasize that while advancements in percutaneous coronary intervention (PCI) techniques have significantly improved patient outcomes, the potential for complications can never be entirely eliminated. It is crucial for cardiologists and cardiac surgeons to possess a comprehensive understanding of the circumstances under which intervention may be necessary, including the appropriate timing, location, and techniques for such interventions.

Although the instances of surgical intervention in conjunction with PCI are relatively rare, the possibility remains that a patient may require surgical assistance during or after the procedure. Therefore, medical professionals must always be adequately prepared to respond effectively if the situation arises. This preparedness includes having the appropriate resources, personnel, and protocols in place to ensure the best possible patient care in the event of unforeseen complications.

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