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Surgical Removal of Guidewire Entrapped Within Stent Struts During Percutaneous Coronary Angioplasty

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ABSTRACT

There has been a growing trend toward percutaneous coronary angioplasty for complex coronary artery lesions. Stent or guidewire break off or trapping within the coronary artery lumen is a rare complication, but it may have fatal consequences. In such cases, the entrapped device may be removed by either percutaneous route or surgical exploration. Here, we report a patient with guidewire entrapment within the struts of the intracoronary stent during primary percutaneous coronary angioplasty, which necessitated surgical removal and subsequent coronary artery bypass grafting (CABG).

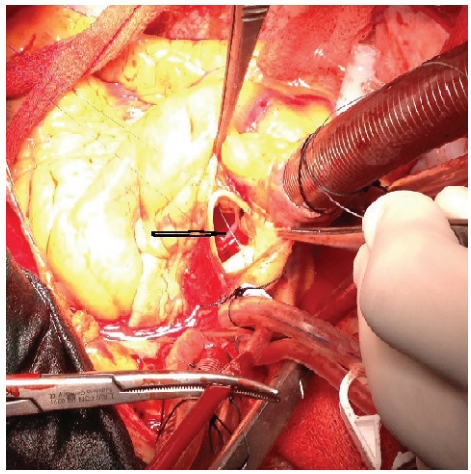
INTRODUCTION

An increasing number of percutaneous interventions and their use on complex lesions have led to a boost in procedures for related complications, including coronary artery dissection or rupture, stent thrombosis, and guidewire entrapment. Guidewire entrapment within the coronary artery is rare, but may have fatal consequences. Entrapped intracoronary devices likely are to be removed via percutaneous route in cases where surgical intervention has failed.

We report a patient in whom a guidewire was entrapped within struts of the coronary stent during percutaneous transluminal angioplasty; it was surgically removed. Subsequently, the patient received CABG.

CASE REPORT

A 45-year-old male with a history of coronary artery stent implantation visited a cardiologist after experiencing chest pain for two weeks. An initial electrocardiogram showed a T-wave inversion on DIII and aVF derivations. The patient's initial Troponin I level was found higher than the upper limit of normal, and he was admitted to the coronary intensive care unit with an acute coronary syndrome diagnosis. Medical therapy included a coronary vasodilator, beta receptor blocker, and anticoagulation. Early after admission, the patient's chest pain was relieved, and no new alterations in his electrocardiogram were reported. The patient's hemodynamic and vital status came back normal. However, three days after admission, the chest pain recurred with increasing intensity, and the patient was transferred to the angiography unit. Diagnostic angiography showed the patient's previous



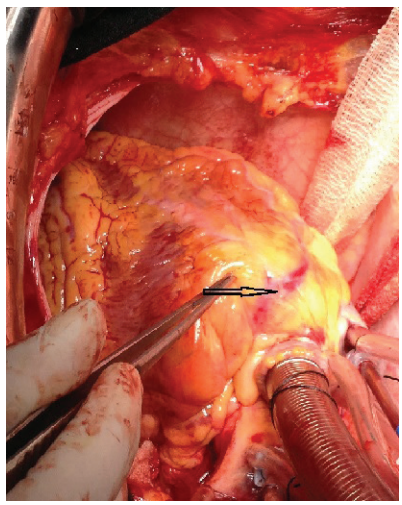


Figure 1. A, Hematoma is seen over the area supplied by proximal segment of the right coronary artery. B, Guidewire is seen within the aortic root after aortotomy.

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Figure 2. Guidewire was found passed through the struts of the stent.

stent within his circumflex coronary artery, and nearly 50% to 60% occlusion was detected. In addition, the right coronary artery (RCA) was found totally occluded from its origin, and there was a poor distal retrograde flow through the circumflex artery. The decision was made to perform angioplasty and stent implantation. Initial balloon dilatation was successful and distal coronary perfusion achieved. Upon successfully implanting a stent within the lesion located close to the RCA ostium, the distal coronary artery bed became thoroughly visible. A second stent successfully was inserted to the consecutive lesion located within the proximal segment of the RCA, more distally to that previously implanted. Soon after the implantation of the second stent, an acute thrombus obstruction occurred within the first stent, which was extending through the RCA ostium. It was decided to aspirate the thrombus and a 0.14 mm diameter floppy guidewire was introduced into the RCA. But the guidewire could not be advanced beyond the mid-segment of RCA, distally to the stent. Guidewire withdrawal failed as it was stuck at the level of the stent. Despite various manipulations, the guidewire could not be taken out. It was as though the guidewire passed through the struts of the stent. So the patient underwent emergency surgery. There was a hematoma on proximal RCA (Figure 1A). A transverse aortotomy was made, and the guidewire was cut and divided. Its proximal part was withdrawn from the femoral artery (Figure 1B), while the distal section was removed together with the stent by being properly pulled out. Guidewire was seen passed through the struts of the stent (Figure 2). CABG surgery was performed to the RCA and circumflex arteries. The RCA was sutured with 6.0 polypropylene because it might be the source of future thrombus and embolization. Postoperatively, the patient's recovery was uneventful, and he was discharged on the seventh day.

DISCUSSION

With the advent of percutaneous devices and techniques used in percutaneous angioplasty, cardiologists are treating more complex coronary lesions. Generally, percutaneous coronary interventions are uneventful, but rare complications do occur and may result in serious complications. Device entrapment or fragmentation within the coronary artery was reported to occur 0.2% to 0.8% of time [Hartzler 1987; Steffefino 1988]. This type of complication may occur with use of guidewires, rotablator rotator angioplasty systems, stents, balloons, or catheters [Kim 2012]. Entrapped devices may result in life-threatening consequences secondary to various complications, including coronary thrombosis, perforation, or cerebral or peripheral embolization.

Basically, three methods are used to address an entrapped or fragmented guidewire within the coronary artery lumen: percutaneous removal of the device, surgical removal, or leaving it in place. In a literature search by Al-Moghairi et al [Al-Moghairi 2013], surgical removal was used in 43.3% of 67 patients, percutaneous treatment was performed in 41.8%, and conservative treatment was performed in 14.9%. Small devices may be left in place without causing any sequel in chronic totally occluded vessels [Hartzler 1987; Savas 1991]. Intervention is mandatory if a large device is fragmented or there is vessel obstruction, thrombosis, embolic phenomena, or rupture. In order to avoid and prevent complications, the device should be removed using the fastest possible way, employing the least invasive method. The first choice is using catheter intervention. There is a wide variety of equipment for percutaneous interventions, including wires (guidewires, j-shaped, etc.), snares (goose-neck, right-angled, loop-wire, etc.), forceps (myocardial biopsy, alligator, etc.), and catheters (balloon dilatation, probing, etc.) [Eisenhauer 1996; Hoyer 1996; Van Allan 1994]. Surgical intervention is mandatory in failed cases of percutaneous methods. Also, excessive traction during percutaneous intervention increases the risk of rupture or acute thrombosis due to possible damage to the arterial wall. In 2011, according to American College of Cardiology/American Heart Association practice guidelines, emergency CABG was a class IIA indication in patients with a device entrapped (fragmented guidewire or stent) within a critical site. The patient should urgently be transferred to operation if the percutaneous intervention failed since the preoperative clinical status of the patient is the major determinant of surgical success. Risk of mortality ranges from 20% to 50% in patients transferred to operation with cardiogenic shock [Holmes 1988; Morris 1999].

A careful evaluation and ensuring a short duration between the intervention and surgery are likely to increase the success of the operation, since the increase in duration was reported to be associated with high risk of perioperative myocardial infarction [Holmes 1988; Morris 1999]. The decision whether to remove or leave the device in place depends on the size and the location of it. Excessive traction by the surgeon may damage the vessel and the device may be left in place if it is small and was entrapped within a chronic totally occluded vessel. However, the guidewire should always be removed if ruptured through the ascending aorta because of the high risk of cerebral and peripheral embolization. Either aortotomy or coronary arteriotomy is performed, depending on the distance from the coronary ostium and a subsequent distal bypass is performed. If the device cannot be removed via aortotomy, it is cut as closely as possible to the coronary ostium and left in place. A coronary bypass is then performed. In our patient, we used surgical removal because of the high risk of cerebral, peripheral, and coronary embolization. We approached through aortotomy as the device was located close to the coronary ostium.

As a conclusion, entrapment and/or fragmentation of a guidewire within the coronary artery lumen is a rare but potentially fatal complication. Therefore, based on the location and size of the entrapped device and considering the clinical status of the patient, surgeons should promptly determine the course of action to fix the problem.

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