

Fatal Subacute Stent Thrombosis Induced by Guidewire Fracture with Retained Filaments in the Coronary Artery

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During percutaneous coronary intervention, guidewire fractures are very exceptionally encountered in medical practice, but can cause fatal complications such as intracoronary thrombus formation, embolization and perforation. Removal of the remnant segments of guidewire is important for the prognosis. There are several methods being recommended for the treatment of fractured guidewire remnants. However, the best treatment of remnant guidewire filament is still unclear. Herein, we present a case where we did not completely remove remnant guidewire filaments that caused fatal coronary thrombosis. (**Korean Circ J 2013;43:761-765**)

KEY WORDS: Percutaneous; Stents; Thrombosis; Complications.

Introduction

Although advances in percutaneous coronary intervention (PCI) have dramatically improved the outcomes of ischemic heart disease, procedure-related complications such as device fractures or dislodgements are also increased. Guidewire fractures are very rare with an incidence of approximately from 0.1% to 0.2% of cases.^{1,2)} Although remnant guidewires can lead to life-threatening complications,^{3,4)} and recently, percutaneous retrieval techniques are considered good therapeutic options, there have been several reports on the remnants being left in coronary artery and aorta without any serious adverse outcomes.^{5,6)}

We describe the case of fatal subacute stent thrombosis caused by guidewire fractures with retained remnant eleven days after the index procedure.

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Case

A 72-year-old woman was referred from another hospital for coronary intervention of distal left main disease. The patient suffered from resting chest pains and dyspnea for over a month. She had no other risk factors besides old age. The electrocardiogram (ECG) showed normal sinus rhythm without any changes in abnormal ST segment. Cardiac enzymes were within normal range. The transthoracic echocardiography showed normal left ventricular systolic functions without regional wall motion abnormalities.

Her left coronary angiogram (CAG) showed tight luminal narrowing at the distal left main coronary artery (LM) with preserved distal coronary flows {Thrombolysis in Myocardial Infarction (TIMI) grade 3} (Fig. 1). The left coronary artery was engaged with the Extra Back Up (EBU) 3.5 guiding catheter (6 Fr, Medtronic, Minneapolis, MN, USA) with side hole via right radial artery. Two 0.014 inch guidewires were positioned into the left anterior descending artery (LAD) (Balanced Middle Weight, Abbott Vascular, Santa Clara, CA, USA) and the left circumflex artery (LCX) (Runthrough, Terumo, Tokyo, Japan). Predilatation and balloon kissing were done with 2.5×20 mm balloon (Trek, Abbott Vascular, Santa Clara, CA, USA) in LAD up to 12 atm and 2.0×20 mm balloon (Genoss, Suwon, Korea) in LCX up to 10 atm. We implanted a 2.75×18 mm everolimus-eluting stent (Xience Prime, Abbott Vascular, Santa Clara, CA, USA) at the proximal segment of LCX with minimal protrusion into the LM, and which was crushed using 2.5×20 mm Trek balloon. We also deployed a 3.0×18 mm everolimus-eluting stent (Xience Prime, Abbott Vascular, Santa Clara, CA,

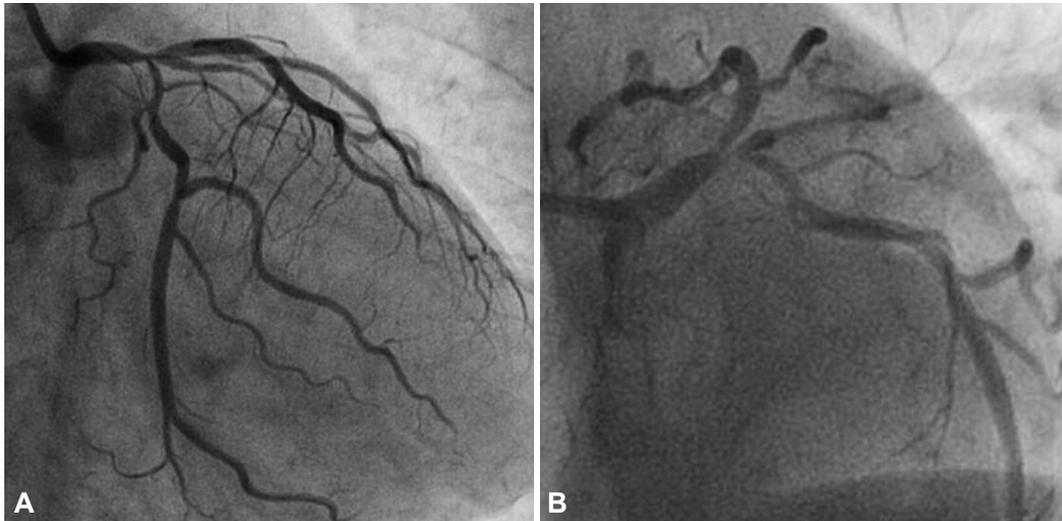


Fig. 1. Left coronary angiogram showed tight and significant stenosis at the bifurcation site of LM. A: right anterior oblique caudal view. B: left anterior caudal view. LM: left main coronary artery.

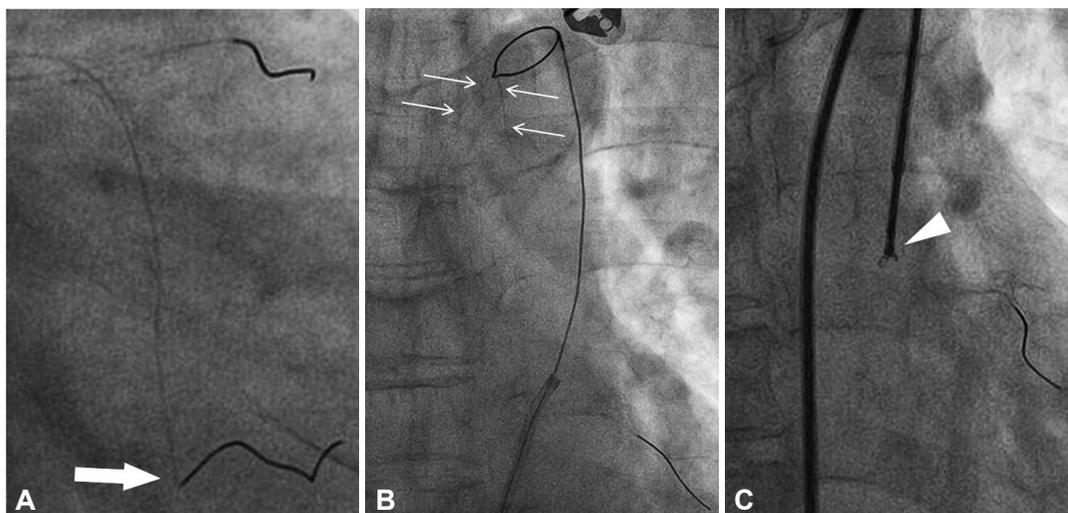


Fig. 2. Guidewire fracture and mechanical removal of the remnants. A: during PCI runthrough, guidewire was broken at the junction of hydrophilic coated part and non-hydrophilic one (thick arrow). B: attempts to retrieve the elongated guidewire filaments in the ascending aorta (narrow arrows) by using a snare device were not successful. C: some parts of the filaments were removed by endoscopic biopsy forceps (arrowhead). PCI: percutaneous coronary intervention.

USA) from the LM trunk to the proximal segment of LAD across the ostium of LCX. We were about to insert intravascular ultrasound (IVUS) catheter into the LCX after successful re-wiring into the LCX with Runthrough guidewire, and then, we realized that the guidewire was kinked at small branch of LCX (Fig. 2A). We tried to remove the guidewire by pulling and rotating softly. Even though the wire was broken at the junction of hard shaft and soft wire tip, we could see the elongated and uncoiled wire remnant swinging in the ascending aorta on cine view (Fig. 2B).

We changed guiding catheter for a bigger one (7 Fr, EBU) via right femoral approach. Several attempts for removal of remnant wire by using Amplatz GooseNeck snare (6 Fr, 15 mm, Loop Snare catheter,

ev3, Plymouth, MN, USA) was not successful (Fig. 2B). We tried again by using endoscopic biopsy forceps (6 Fr, 1550 mm, Olympus, Tokyo, Japan) (Fig. 2C). Eventually, we caught the broken wire and could remove a part of the wire (Fig. 3), leaving the soft tip in the small branch (Fig. 4A and B). The radiopaque remnant was fixed to the vessel wall by an additional stent implantation (2.75×23 mm, Xience Prime, Abbott Vascular, Santa Clara, CA, USA). Final angiographic results were good. Elongated and un-coiled filaments were not seen within LM and proximal LCX on cine view. However, the un-coiled filaments were identified within the distal LM and proximal LCX on IVUS (Fig. 4C). The patient strongly declined a surgical removal of the remnants. Glycoprotein IIb/IIIa inhibitor was adminis-



Fig. 3. Un-coiled filaments of the runthrough guidewire with biopsy forceps (A and B).

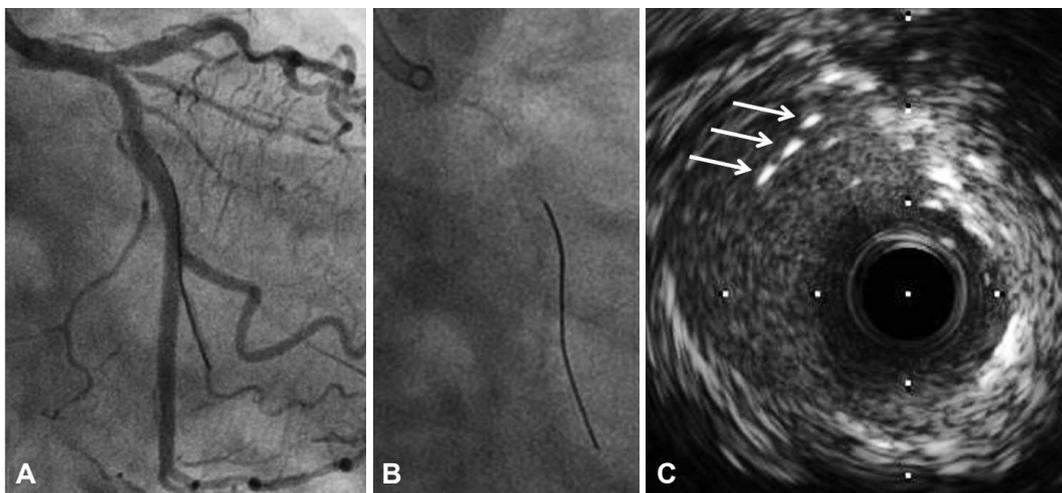


Fig. 4. Cine and IVUS images after mechanical extraction of the fractured guidewire. A: the radiopaque tip of runthrough guidewire was evident within the LCX and its small branch. B: long and thin guidewire filaments were not seen in cine view. C: IVUS showed guidewire filaments (arrows) remaining from the proximal LCX to distal LM. PCI: percutaneous coronary intervention, LCX: left circumflex artery, LM: left main coronary artery, IVUS: intravascular ultrasound.

tered to the patient. After seven days, the patient was discharged with triple antiplatelet agents including aspirin, clopidogrel, and cilostazol.

Four days later, the patient revisited the emergency department with acute chest pain in shock state. ECG showed ST-segment elevation in lead aVR and aVL and ST-segment depression in lead II, III, aVF, and V 4–6. Shortly afterwards ventricular tachycardia was developed and we performed cardiopulmonary resuscitation immediately. Percutaneous cardiopulmonary support (PCPS) was applied at the bed side right away, and then, the patient was sent to the coronary catheterization laboratory. Bed side echocardiography demonstrated severe LV systolic dysfunction with about 20% of the ejection fraction.

Emergency CAG was performed immediately and it revealed that

LM was totally occluded due to subacute stent thrombosis (Fig. 5). We inserted intra-aortic balloon pump. The TIMI flow was recovered to grade II after aspiration thrombectomy and balloon angioplasty at LM (3.0×20 mm, Ruyjin, Terumo, Tokyo, Japan) and LCX (2.5×20 mm, Trek). Finally, the kissing balloon procedure was followed.

After recovery of coronary flow, the patient's heart function seemed to improve echocardiography gradually. On the 6th hospital day, weaning from PCPS was successfully, however, the patient was in septic condition, with decreasing courses due to unknown bacterial or fungal infections. Disseminated intravascular coagulation was getting worse and acute renal failure was not improving despite the continuous renal replacement therapy. Eventually, we lost the patient on the 15th hospital day.

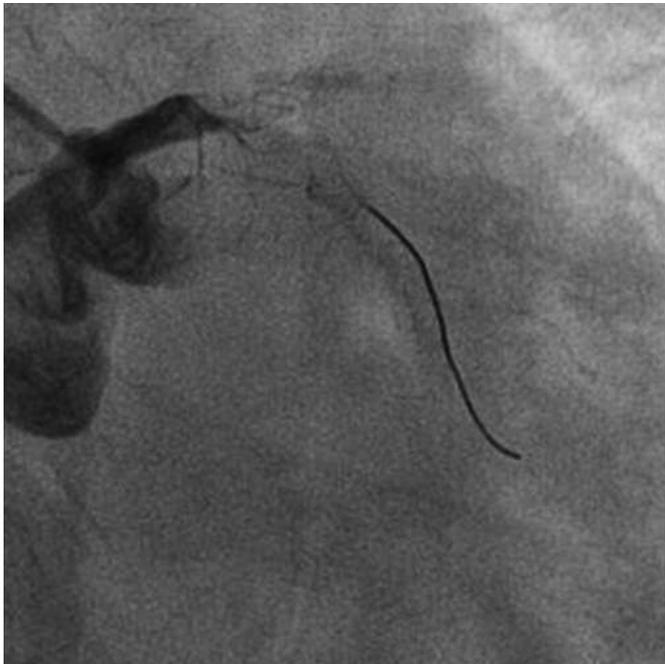


Fig. 5. CAG showed LM total occlusion with remnant guidewire. LM: left main coronary artery, CAG: coronary angiogram.

Discussion

With the continued advances in percutaneous techniques for revascularization of coronary artery diseases, interventional cardiologist began to intervene in more complex coronary lesions. Entrapments on hardware materials of angioplasty have been reported for guidewires, balloons, Rotablator systems, stents, and angiographic catheters usages.⁷⁾⁸⁾ The complications of remnant guidewires could be life-threatening because it could lead to coronary thrombosis, perforation and embolization.³⁾⁴⁾ Bifurcation lesions, tortuous and calcified lesion, use of firm tipped guidewire are important risk factors for guidewire entrapments and fractures. Especially when the hydrophilic coated guidewire tips can be easily broken in calcified and tortuous lesions. Therefore, the operator should more careful, when treating complex lesions with hydrophilic guidewires.⁹⁾

There are several methods recommended for the treatment of fractured guidewire remnants. Some cardiologists with limited interventional experiences preferred urgent surgery. However, the surgery should be considered after failures of interventional methods, and there are no guidelines for surgical indications.⁹⁾ Percutaneous retrieval techniques of fractured guidewires include the use of snare loop or goose-neck snare, double or triple wire rotation,¹⁰⁾ use of tortuous catheter,¹¹⁾ use of a balloon as a wedge for extracting guidewire fragments¹²⁾ and biopsy forceps.¹³⁾ These techniques may be difficult and time-consuming for inexperienced cardiologists, and furthermore, they can cause endothelial injury, dissection and thrombosis.¹⁴⁾

The best way to solve the sticky problem is the complete removal

without complications. However, when it is not possible to get rid of the wires, fixing the thrombogenic materials to the vessel wall with stents can be a viable alternative to minimize the risk of thrombosis by device remnant.⁹⁾

Remained guidewires in the coronary arteries may not always cause serious adverse effects. Non-metallic and hydrophilic guidewire tips are not highly thrombogenic, and it is reasonable to leave such remnants in small side branches or chronically occluded vessels.⁹⁾ Several conservative treatment cases were reported. In the reported cases, leaving the guidewire remnants within the left coronary artery and ascending aorta did not cause any serious complications during several months of follow-up period.⁵⁾⁶⁾ Conservative treatments are preferred when risks of interventional techniques or surgery outweigh its benefits in particular to patients who remain asymptomatic and hemodynamically stable.⁶⁾

In our case, we have tried many ways from using snares to endoscopic biopsy forceps in order to remove the remnant wires. Despite all our efforts, upon closing of the procedure, we could remove only a part of the remnant in the ascending aorta. Because the patient refused further trials to remove the remnant wires, we had no choice but to leave the long and thin wire filaments into the proximal circumflex artery and distal LM where drug eluting stents had been deployed. Despite triple antiplatelet therapy, the result was thrombus formation within the stent at the LM. According to the case, we conclude that fractured guidewire is one of the most dangerous complications of PCI. In similar cases, there are fears that the remnants within a coronary stent could result in stent thrombosis. If removal of such materials percutaneously is impossible, early surgical interventions should be considered.

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