



Guidewire Fracture during Crossing A Chronic Coronary Total Occlusion: A Troublesome Experience

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Abstract

Increased interest focusing on coronary chronic total occlusions has emerged since several studies have proven improved cardiovascular outcomes and quality of life after successful chronic total occlusion (CTO) revascularization. CTO of an epicardial coronary artery is one of the leading challenging complex lesion type when percutaneous coronary intervention (PCI) is indicated. Advanced antegrade and retrograde techniques performed with dedicated equipment have provided significant improvements in procedural success and decrease periprocedural complications leading to PCI failure. However, entrapment and fracture of intracoronary devices may complicate PCI procedures even though these occur rarely. We represent a case of a guidewire fracture and entrapment in the subintimal space during antegrade crossing of a CTO.

Keywords

Complication, Guidewire, Fracture, Entrapment

Introduction

Increased interest focusing on coronary chronic total occlusions has emerged since several studies have proven improved cardiovascular outcomes and quality of life after successful revascularization of a chronic total occlusion (CTO) [1]. CTO of an epicardial coronary artery is one of the leading challenging complex lesion type when percutaneous coronary intervention (PCI) is indicated. Advanced antegrade and retrograde techniques performed with dedicated equipment have provided significant improvements in procedural success and decrease periprocedural complications leading to PCI failure [2,3]. However, in spite of these advanced equipment and appropriate techniques by experienced operators, periprocedural complications may occur which may also result in procedural failure, increased morbidity and mortality. We represent a case of a right coronary artery CTO procedure which was complicated after fracture and entrapment of the guidewire in the sub-intimal space during antegrade crossing of the occlusion.

Case Report

A 56-years old man was admitted to our cardiology outpatient department with Canadian Cardiac Society Class II stable angina pectoris that has been continuing for the last six months. His past medical history revealed hypertension and hyperlipidemia. Myocardial perfusion scintigraphy demonstrated inferior ischemia and diagnostic coronary angiography showed a long CTO of the right coronary artery (RCA) and retrograde distal filling of RCA from septal collateral channels of left anterior descending artery (Figure 1). Afterwards, percutaneous coronary intervention (PCI) to CTO of RCA was planned. We decided to recanalize the occluded vessel by

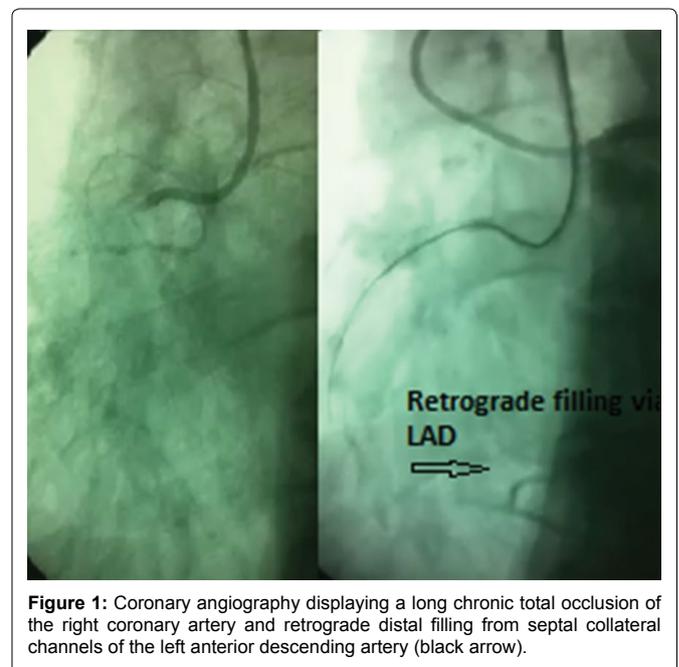


Figure 1: Coronary angiography displaying a long chronic total occlusion of the right coronary artery and retrograde distal filling from septal collateral channels of the left anterior descending artery (black arrow).

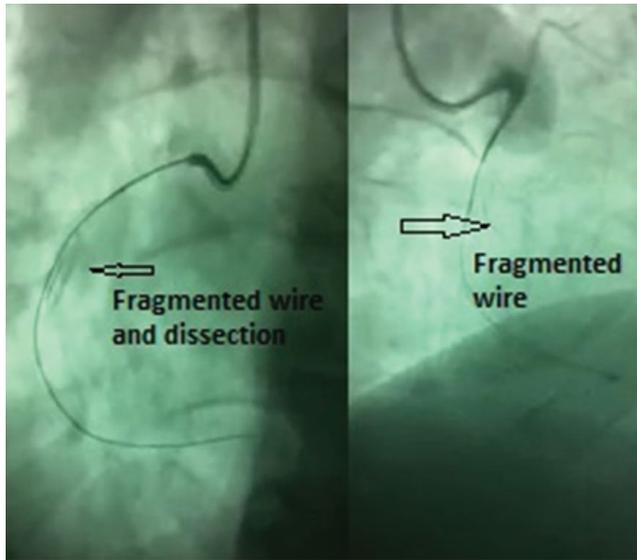


Figure 2: Coronary angiographic views demonstrating the coronary dissection and fractured guidewire in subintimal space.

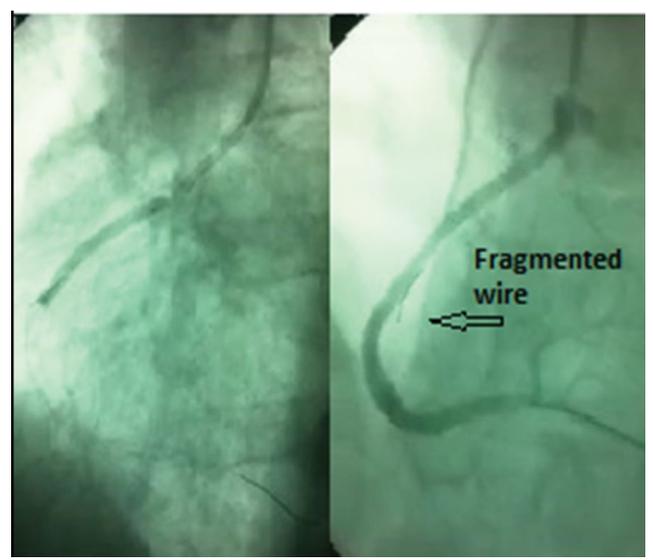


Figure 3: Full coverage of the dissection and the fractured guidewire after stent implantation into the chronic occluded segment.

using antegrade approach. RCA was cannulated with a left amplatz 1 guiding catheter and a stiff guidewire with a tip load of 9 grams (Conquest Pro, Asahi, Intecc) was chosen to penetrate the proximal cap with the support of a microcatheter (Corsair, Asahi, Intecc) due to the absence of microchannels. Conquest Pro succeeded to penetrate the proximal cap of the occlusion, however it went subintimally and caused a dissection which was endorsed by over-manipulation of the guidewire. We tried to remove the guidewire but it was trapped and we failed to pull it out. Therefore, we applied a more forceful and aggressive traction to extract it and succeeded in pulling it out however we saw that the guidewire was broken from its tip. Coronary angiography revealed that the tip of Conquest Pro guidewire was still in the subintimal space (Figure 2). Since the patient did not have any symptoms and there weren't any signs of perforation in the angiography, we decided to leave this guidewire subintimally and went on the procedure with another conquest pro guidewire. We were able to cross the lesion with the second guidewire and recanalized the occluded segment by stent implantation. The entrapped guidewire was in the subintimal space and fully covered with the stent (Figure 3). The patient was discharged on the second day following the intervention without any symptoms after performing transthoracic echocardiography which confirmed that there was no new regional wall motion abnormality and pericardial effusion. Follow-up visit at the sixth month indicated a symptom free interval without any ischemic type chest pain.

Discussion

Entrapment of the guidewires in the coronary arteries is rarely seen but may be complex to handle. The reported incidence of guidewire fracture varies between 0.02- 0.08 % of cases undergoing PCI [4,5]. Hartzler et al. reported eight cases of guidewire entrapment and only one case of retained guidewire [6]. Treatment is controversial, since retained intraluminal guidewire can cause thrombosis and ischemia and retrieval is strongly suggested [7-9]. Surgery and different percutaneous techniques can be used for removing these entrapped guidewires [9-12]. Similar to us, there are cases of periprocedural guidewire entrapments with device loss successfully treated without snaring [4,5]. The possibility of guidewire fracture and entrapment increases in conditions in which guidewire is trapped between two stent struts, or between the guiding catheter and the artery. Over rotation of the guidewire and forceful manipulations in complex lesion anatomy such as severe calcification and/or chronic total occlusions may also cause guidewire fracture as in our case. There were two reasons why we did not to try to remove it. The first reason was the patient's clinical condition and control angiographic view which indicated a stable symptom free hemodynamics and

absence of coronary perforation. Secondly, the fractured tip was in the subintimal region of a long chronic total occlusion where snare system could not reach the stucked material. In contrast, intraluminal retained guidewires can cause acute thrombosis or can embolize, therefore any intraluminal stucked or embolized device should be removed or covered and crushed with another stent. In addition, guidewires extending into the aorta must also be retrieved. In cases in which broken guidewire remnant is in the distal coronary branches or in a chronic total lesion or trapped in the subintimal space ,since thrombosis or embolization is unlikely, guidewire fragment can be left inside.

The construction and structural characteristics of the guidewires used in CTO revascularization should be considered in each case since stiffness, trackability, penetration capacity, tip weight, tapering and durability of different guidewires could determine procedural success or complications. New double coil structure guidewires such as Gaia guidewire series (Asahi Intecc Co., Ltd.) developed for CTO crossings could provide advantages over conventional stiffer guidewires with their improved flexibility, torqueability and resiliency which avoid entrapment in the hard tissue. Even though these new technology guidewires are prone to rupture in some complex conditions, their dual core structure may allow entrapment of a thin filament which could be managed easier compared with conventional stiffer guidewires [13].

Majority of the periprocedural guidewire fractures and entrapments are due to operators even though these procedures are commonly performed by experienced interventionalists. Inappropriate guidewire selection could be prevented by meticulous evaluation of the angiographic views including collaterals, proximal stump, severe calcification, lesion length and side branches adjacent to the occlusion. However, more importantly, forceful manipulations should be avoided especially in cases of severe calcifications, long occlusions and excessive tortuosity. Over rotation and aggressive pushing of stiff guidewires could easily result in entrapment and device loss in the coronary artery and should also be avoided. Even though, snaring of the entrapped guidewire is strongly recommended in majority of the cases, covering the entrapped material with a stent could be the alternative treatment option in such conditions as in our case.

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