Rotational atherectomy via transradial access in the percutaneous treatment of chronic coronary total occlusion with rare complication of coronary guidewire transection

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Abstract

Transection of the coronary guidewire during rotational atherectomy recanalization procedure in the treatment of coronary chronic total occlusion is very rare. While uncommon, there are a number of well-described complications including perforation, thrombosis and arrhythmia. Here we report a distal transection of the guiding wire during rotational atherectomy via transradial access in the percutaneous treatment of chronic coronary total occlusion. This complication was seen in the treatment of chronic occlusions, which are therefore not risk-free procedures. The procedure ended after a simplified stenting technique.

Keywords: Transection of the coronary guidewire, rotational atherectomy, chronic total coronary occlusion, transradial access

Introduction

Chronic total coronary occlusion remains one of the limitations of percutaneous transluminal coronary angioplasty, and few therapeutic devices are specifically designed to address this problem. Despite advances in device technology, the management of resistant, calcific lesions remains one of the greatest challenges in successful chronic total coronary occlusion intervention. Established techniques to modify calcific lesions include the use of high-pressure non-compliant balloon dilation, cutting-balloons, anchor balloons, Tornus catheter and high speed rotational atherectomy. Rotational atherectomy facilitates in percutaneous coronary intervention for chronic total coronary occlusion with severe calcification.

Transradial intervention of chronic total coronary occlusion is increasing in frequency and is associated with lower major vascular access site complications. However, the small size of the radial artery is a major limitation of this technique, especially for rotational atherectomy. We reported a rare case of patient, who had coronary angiography for recurrent chest oppression, complicated with transection of the coronary guidewire during rotational atherectomy in the treatment of coronary chronic total occlusion underwent successful bailout stenting, and intensive care. Causative factors are described and suggestions are proposed to manage this problem.

Case presentation

In July 2014, a 64-year-old man with history of coronary artery disease, cerebrovascular accident, hypertension and hyperlipidemia presented himself for chest oppression in recent few days. He visited our ward complaining of sudden chest oppression, dyspnea, and left shoulder pain with cold sweating while sleeping. Medications included clopidogrel (75 mg daily), linagliptin...
(5 mg daily), and aspirin (100 mg daily). Alcohol and smoking were irrelevant considerations.

His body-mass index was 30 (kg/m²), indicating obesity. Blood pressure registered 117/69 mm Hg with a regular heart rate of 86 beats per minute. Cardiac examination was normal. Auscultation of the neck showed normal carotid upstrokes but revealed a middle-pitched bruit only in systole at the angle of the left jaw. A detailed neurologic examination proved normal. Surface electrocardiogram showed normal sinus rhythm with left atrial enlargement, left ventricular hypertrophy and secondary repolarization abnormality. Initial laboratory data such as biochemistry, electrolytes and blood cell count were normal. Subsequent chest plain film showed tortuous thoracic aorta and pacemaker implantation. Two-dimensional transthoracic echocardiogram also vividly demonstrated impaired left ventricle contractility with regional wall motion abnormality. Myocardial perfusion scan was previously arranged to further determine the nature of cardiovascular accident. Significantly, partial reversibility with remarkable ischemia was observed at inferior and inferolateral segment.

Arteriography yield consistent with estimates of the prior image study and showed left main with triple vessels disease. Coronary artery bypass surgery was suggested by the attending physician. However, after discussion with heart team and his family, the patient refused coronary artery bypass surgery and preferred percutaneous coronary intervention. The target lesion was chronic total occlusion in the proximal right coronary artery (Figure 1). The patient had visible and continuous collaterals, and we performed antgrade approach for chronic total occlusion access. Via his right radial artery with 6F radial introducer sheath (Cordis, Miami, FL, United States of America), 6F AL1 (Cordis, Miami, FL, United States of America) was engaged to right coronary artery smoothly. The procedure is associated with usage of many different types of dedicated guidewires (ASAHI Gaia series PTCA guide wire receives CE mark Nagoya, Japan ASAHI INTECC CO., LTD.) in the process, aiming to recanalize the occluded vessel. At length, the guidewire could cross the lesion after several times of approaches but it is impossible to advance any device over the wire through the occluded segment, even after advanced technique, including anchor balloon, mother-child catheter, and parallel wire technique.

Heavily calcified right coronary artery lesions with a 90-degree exit angle were encountered in practice. We also assessed the application of the Tornus catheter to overcome the inability to cross a chronic total occlusion with a balloon catheter and to improve the success rate of percutaneous recanalization of chronic total occlusion.

Subsequent attempts at rotational atherectomy showed satisfactory results with optimal modification in the right coronary artery. Rotawire (Boston Scientific, Maple Grove, MN) was used in an unsuccessful attempt to cross the lesion. The lesion was ultimately crossed using a 0.014-in. Wire mounted in a Transit infusion catheter (Cordis) then exchanged for a Floppy Rotawire (Boston Scientific, Maple Grove, MN). A 1.25-mm Rotablator burr (Heart Technology) was tested outside the body then advanced to a platform position proximal to the lesion and tested to 180,000 RPM (Figure 2). Advancement of the burr over the kinked wire resulted in transection (Figure 3). Bailout stenting was achieved with sealing of the multiple entry and exit sites created by the transection fragment and by complete coverage of the intramural hematoma (Figures 4 and 5). After confirming the absence of flow disturbance or any other complications associated with rotational atherectomy, the strategies and management were deemed successful. The patient recovered well and discharged the following days. When seen again in August 2014, the patient recovered uneventfully.

**Discussion**

Treatment of chronic total occlusions remains a limitation of percutaneous revascularization and is associated with lower immediate success and higher long-term restenosis rates compared to less severe stenosis [1]. While part of the problem in dealing with total occlusions relates to successfully passing a wire across the occluded segment, most chronic occlusions contain large plaque burdens [2]. Balloon dilatation sometimes falls to restore antegrade flow and often yields suboptimal angiographic results in these situations [3,4]. Rotational atherectomy has proven useful in treating calcified and diffusely-diseased vessels and appears attractive for debulking lesions with large atheromatous plaques [5,6].

Transradial coronary intervention is a safe and effective method of percutaneous revascularization. Furthermore, the indications for transradial percutaneous coronary intervention are expanding [7,8]. Traditionally, high-speed rotational atherectomy
The Rotawire in the right coronary artery was transected (arrow) at the junction of shaft and radiopaque tip. Attempts for retrieval of a fractured and entrapped Rotawire in the right coronary artery by using paired guidewires knotted technique ensued. Bailout stenting was achieved with sealing of the multiple entry and exit sites created by the transection fragment and complete coverage of the intramural hematoma. Subsequent image of percutaneous coronary intervention showed staged procedures with satisfactory outcomes.

(HSRA) has been performed through 8 and 9 Fr catheters, which has limited its use during radial percutaneous coronary intervention [9]. The transradial access represents a promising alternative to transfemoral access to treat patients undergoing chronic total occlusion percutaneous coronary intervention in our several successful angioplasty. The presented data and experience may be useful to plan transradial percutaneous coronary intervention attempts on chronic total occlusion lesions [10].

The most frequently seen complications associated with rotational atherectomy include intimal dissection, distal artery spasm, perforation, acute target vessel closure, and non Q-wave myocardial infarction. Guidewire fracture during rotational atherectomy is an infrequent complication, with a rate of 0.2% reported by Heart Technology [11-13]. However, some retained...
Various methods of device management are available in The specific technique that is used tends to vary with anatomy and composition, and the availability of open surgery facilities remains mandatory during this procedure. Here coronary artery angulation, a highly calcified coronary artery, and advancement of the burr over the kinked wire probably all contributed to unexpected events. As well surgeons need to consider the mechanical and physical characteristics of commonly-used wires prior to intervention, in order to avoid excessive manipulation that could exceed device capacity. They need to exert extra caution and not assume that following standard procedure will always produce the expected result.

Conclusion
Chronic total occlusion constitutes one of the most difficult scenarios for interventional cardiologists. Rotational coronary atherectomy is an effective treatment for chronic total occlusion with calcified lesions. We report a rare case of guidewire transection during rotational atherectomy in treatment for chronic total occlusion of right coronary artery. The majority of the procedures were carried out successfully with a 6 Fr guide and a 1.25 mm burr. We believe that smaller burr size would be more than adequate for plaque compliance alteration and for partial debulking, which could help facilitate ballooning and stenting.

If and when problems occur, reliance upon following the standard protocol and experienced expertise in order to achieve positive results is usually the norm. Even so, we believed that sometimes an untempered focus upon standard procedure may have the opposite effect. Both operators and manufacturers need to be acutely aware of the possibility of such events occurring. Moreover, intravascular ultrasound is a valuable tool to confirm the true lumen course of the successful wire and to guide the stenting procedure.

Consent
Written informed consent for publication of this case report and accompanying images was obtained from the patient. A copy of this written consent is available upon requested.

Competing interests
The authors declare that they have no competing interests.

Authors’ contributions
Zhen-Yu Liao: Carried out writing, literature search, and image editing.
Shih-Chi Liu: Made substantial contributions to analyze and interpret the patient data.
Kou-Gi Shyu and Shen-Chang Lin: Participated in coordination writing, and image editing.

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