Salvage for Long-Tract False Lumen Dissection via IVUS Guidance in CTO Lesions

Cheng-Ching Wu, Hsiu-Yu Fang and Chiung-Jen Wu

Revascularization of coronary arteries with chronic total occlusion (CTO) was thought to be one of the last frontiers in coronary intervention. Here, a 75-year-old female patient with percutaneous coronary intervention (PCI) for left anterior descending artery (LAD) CTO lesions via radial approach is described, in which target-vessel revascularization was performed via guidance of IVUS with a 6F guiding catheter. This technique salvaged long-tract dissection which was induced by false lumen wiring followed by long-tract balloon dilatation. Successful re-wiring to the true lumen could be done via the guidance of IVUS, even by radial approach with only the 6F guiding catheter.

Key Words: Chronic total occlusion • Intravascular ultrasound • Percutaneous coronary intervention • Trans-radial

INTRODUCTION

The rate of unsuccessful revascularization for chronic total occlusion (CTO) has been reported at around 30~40%.1-4 Although success rates by routine femoral approach have increased due to novel techniques including contra-lateral injection, “parallel” wire techniques, subintimal tracking and re-entry (STAR), retrograde approach with control antegrade retrograde tracking (CART), reverse CART, and intravascular ultrasound (IVUS) guidance,5 CTO remains a challenging technique in interventional cardiology. There is some evidence that successful percutaneous coronary interventions (PCIs) leads to an improvement in long-term survival rates,6 but failed recanalization may be associated with long-term adverse events. In this article, for one case of left anterior descending artery (LAD) CTO, attempted PCI was performed via trans-radial (TR) approach, subintimal wiring and balloon dilatation from the proximal portion of the LAD, which induced long-tract false lumen dissection. Re-direction of another wire to the true lumen via IVUS guidance and stenting to the true lumen were performed successfully.

CASE DESCRIPTION

A 75-year-old female patient was transferred to our institution for coronary angiogram because of a reversible perfusion defect in the apical area of her left ventricle shown by thallium scan. The coronary angiogram showed CTO at the proximal LAD. After administration of 10,000 units of heparin, a 6-French Ikari Left 3.5 (Terumo, Japan) guiding catheter was engaged in the left main trunk ostium, via the left radial artery. Antegrade approach was attempted initially by using the combination of a 0.014-mm Miracle-3 wire (Asahi Intec, Japan) and a Ryujin Plus OTW 1.25 × 10-mm balloon (Terumo, Japan). After the wire was advanced into the distal LAD, the whole LAD tract was dilated by a Ryujin Plus OTW...
1.25 × 10-mm balloon catheter and followed by a Monorail Maverick 2.5 × 30-mm balloon (Boston Scientific). Following angiogram, the whole LAD tract showed spiral dissection (Figure 1). Intra-coronary ultrasound was performed, and the image revealed that the IVUS catheter was in false lumen (Figure 1). We left the first wire in the subintimal tract as a road map, utilizing IVUS image to confirm the subintimal entering point, and selected true lumen with a second wire. Another Miracle-3 wire finally entered the true lumen, which was proved by IVUS study again (Figure 2A). A Monorail Maverick 2.5 × 30-mm balloon was used for pre-dilatation of the LAD. Finally, a Multi-Link Pixel 2.5 × 28-mm stent (Abbott, USA) and a Multi-Link Zeta 3.0 × 38-mm stent (Abbott, USA) were deployed from the distal to the mid portion of the LAD. The final angiogram showed TIMI 3 flow and a clear septal branch (Figure 2B).

**DISCUSSION**

With regard to revascularization of coronary arteries

**Figure 1.** Left anterior oblique cranial view revealed left anterior descending artery had spiral dissection from the mid portion after balloon dilatation. Intravascular ultrasound (IVUS) study showed IVUS catheter was in subintimal lumen.

**Figure 2.** (A) Intravascular ultrasound (IVUS) study via wire in the false lumen showed the other wire was successfully advanced into the true lumen. (B) Left anterior oblique cranial view. LAD status post deployment of a Multi-Link Pixel 2.5 × 28-mm stent (Abbott, USA) and a Multi-Link Zeta 3.0 × 38-mm stent (Abbott, USA). Clear septal branches are shown.
with chronic total occlusion, application of 7F guiding catheter is supposed to be the mainstream. In this case, approach via radial artery with 6F guiding catheter heightened the degree of difficulty. Furthermore, predilatation without contra-lateral injection to confirm wire in true lumen enhanced the risk of vessel perforation, hematoma or damage of collateral circulation, etc. Actually, in such acute technical failure of endovascular treatment of CTOs, false lumen wiring can be rescued by true lumen re-entry devices. However, the majority of application experience with these kind devices was in peripheral vascular intervention. In addition, such devices are still not available in our institution.

Multiple applications of IVUS for coronary CTO procedures have been previously described. The IVUS-guided wiring technique for chronic occluded coronary artery has been reported at many international conferences before. Previous reports had described similar cases of subintimal wiring, with IVUS guidance in successfully redirecting a second wire into the true lumen, but those cases were approached via the femoral artery with a 7F guiding catheter. The main challenge of this case was to redirect a new wire into the orifice of the true lumen of the occluded LAD. In particular, the dilated false lumen would result in the wire always taking the easy route. Via radial approach and using 6F guiding catheter doesn’t allow microcatheter and IVUS catheter simultaneously for real-time IVUS imaging. However, even combination of 7F guiding catheter and the conventional “side-looking” IVUS couldn’t supply real-time image, it only allows detection of true lumen wire insertion, but doesn’t diminish blind trials for true lumen searches. In this case, via radial approach with 6F guiding catheter, IVUS supplied the confirmation of the subintimal deviation point and the detection of wire in true or false lumen. It still supplies a safe and effective method for selecting a true lumen in specific CTO cases.

REFERENCES