CASE REPORT
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A Newly Developed Stent Thrombus Related to Optical Coherence Tomography

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ABSTRACT

Optical coherence tomography (OCT) is a useful coronary imaging tool for atherosclerotic plaque characterization and stent evaluation. However, proximal balloon inflation is required in order to reduce signal changes caused by red blood cells and to acquire a clear image. One rare acute complication related to proximal balloon occlusion is micro-thrombus formation. We report a case of multiple, acute micro-thrombi forming after an OCT procedure, despite the use of appropriate prevention for intracoronary thrombus formation. **(Korean Circ J 2008;38:674-676)**

KEY WORDS: Optical coherence tomography; Thrombosis.

Introduction

Optical coherence tomography (OCT) is a useful coronary imaging tool for atherosclerotic plaque characterization and stent evaluation.[1)] Since proximal balloon occlusion is necessary to obtain a clear image by OCT, operators performing OCT should not only have a higher level of technical proficiency, but should also make every effort to concentrate closely on the procedure. However, serious complications may rarely occur, even after all these precautions are taken. We report a case of a patient who exhibited acute thrombus formation and underwent distal thrombo-embolization during OCT.

Case

A 77-year-old male patient was admitted to the hospital, where he underwent follow-up coronary angiography (CAG). He was a 7 pack-year ex-smoker who had quit using tobacco 10 years prior. He had no history of hypertension, diabetes mellitus, or chronic renal failure. He had undergone coronary angioplasty in the middle segment of the left anterior descending artery (LAD) due to stable angina 9 months prior. At that time, CAG revealed 90% diffuse eccentric luminal narrowing in the middle segment of the LAD, 70% diffuse eccentric luminal narrowing in the distal segment of the left circumflex artery (LCX), and 60% discrete luminal narrowing in the ostium of the posterior descending artery (PD). A zotarolimus-eluting stent (Endeavor, 2.75×28 mm, Medtronic, INC., MN, USA) was inserted in the LAD (Fig. 1). After stent insertion, the patient took 100 mg of aspirin and 75 mg of clopidogrel daily until a 9-month follow-up CAG was performed. The follow-up CAG was performed after 3,000 U of heparin was injected intra-arterially. The procedure revealed the patent previously inserted stent in the middle segment of the LAD (Fig. 2). In order to evaluate neointimal growth in the in-stent portion, intravascular ultrasound (IVUS) was performed in the middle segment of the LAD after administration of an additional 2,000 U of heparin. IVUS showed the entire stent covered with neointimal growth, but no thrombus formation (Fig. 3A). An OCT was subsequently performed in order to ascertain the neointimal formation covering the stent strut. OCT revealed a well-positioned stent strut covered by neointimal growth (Fig. 3B). During pull-back of the image wire, multiple micro-thrombi were observed (Fig. 4A). A follow-up angiography was performed. The angiography revealed thrombo-embolism in the far distal segment of the LAD (Fig. 4B). The patient complained of chest pain, but an electrocardiogram showed no interval change of the ST segment, and the chest pain resolved within a few minutes. After CAG, the patient's peak serum creatine kinase MB level

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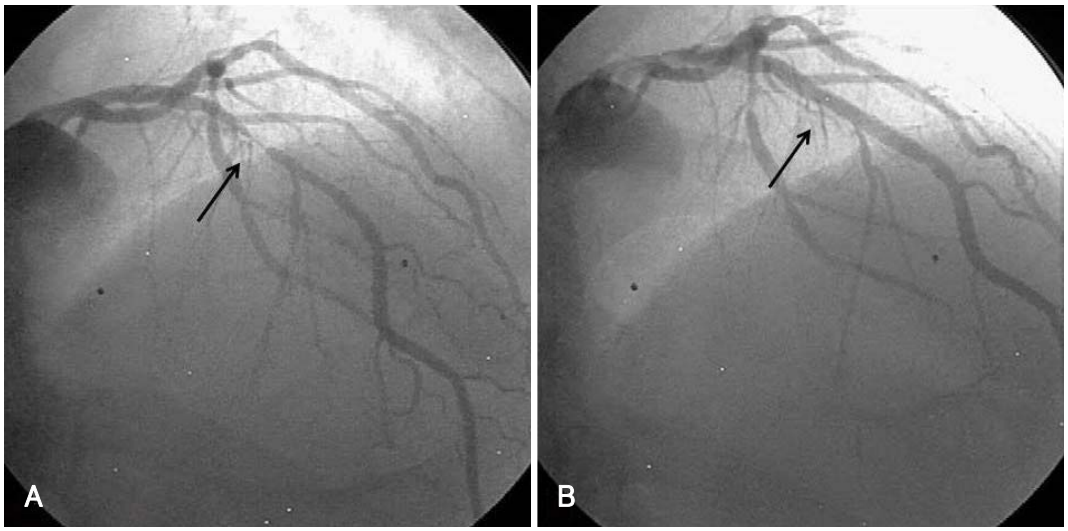

Fig. 1. Coronary angiography (CAG) before 9 months showed the culprit lesion (dark arrow) in the middle segment of the left anterior descending (LAD) artery (A), and CAG after zotarolimus-eluting stent implantation (B) showed that the stenosis of the culprit lesion (dark arrow) had resolved.

Fig. 2. Follow-up coronary angiography showed a patent stent in the middle segment of the left anterior descending (LAD) artery.

was checked at 31.56 ng/mL. We gave the patient heparin intravenously for 24 hours and performed second stage CAG in order to accomplish coronary angioplasty at the lesion in the LCX and evaluate the distal segment of the LAD. Angiography showed partial resolution of the thrombi in the distal LAD. Percutaneous coronary angioplasty was performed to treat the LCX lesion, and the patient was discharged without deterioration in his condition.

Discussion

OCT is an emerging modality in plaque characterization that utilizes infrared light. Although IVUS assesses the plaque volume and stent status,[2)3)] OCT images can provide the additional morphologic information to identify plaque characteristics that cannot be visualized with IVUS.[4)] OCT images are able to provide better plaque characterization because of their resolution (10-20 μm), which is 10 times higher than that of IVUS. Therefore, OCT can characterize thin cap fibroatheromas (<65 μm) and macrophage distribution, which characterize vulnerable plaques.[5)6)] According to a recent study by Kume at al.,[7)] OCT has a higher sensitivity than does IVUS with regard to the detection of lipid-rich plaques (85% vs. 58%, p=0.03).

However, OCT has some disadvantages compared with other coronary imaging tools. First, OCT relies on infrared light, which has a poor penetration depth limited to 2-3 mm and does not allow for visualization of the total lipid pool of the large plaque or the positive or negative remodeling of the vessel.[8)9)] OCT signal is also attenuated by red blood cells. Therefore, a blood-free imaging zone is needed in order to acquire clear images.[10)] A blood-free imaging zone can be achieved using proximal balloon inflation and saline flushing techniques. Thus, the OCT procedure can cause myocardial ischemia through proximal balloon inflation. The currently recommended maximal balloon inflation time is 35 seconds.[11)] In our case, despite appropriate prevention of intracoronary thrombus formation, acute thrombus formation occurred at 25 seconds after proximal balloon inflation and saline infusion.

In conclusion, OCT is a useful modality for plaque characterization and stent evaluation. However, acute complications related to proximal balloon occlusion can rarely occur. We experienced a case of acute thrombus formation related to the OCT procedure.

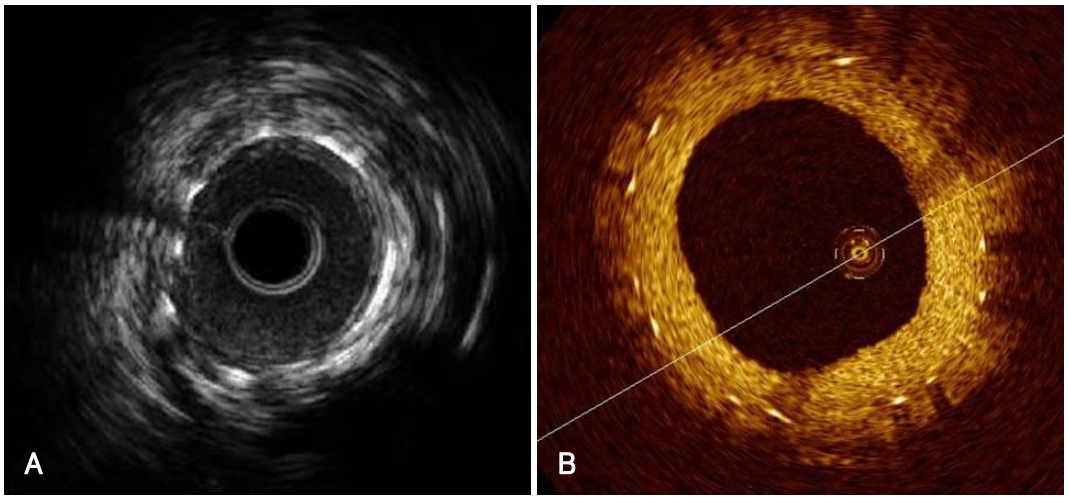

Fig. 3. Intravascular ultrasound (IVUS) (A) and optical coherence tomography (OCT) (B) showed the neointima covering the stent struts and no thrombus formation.

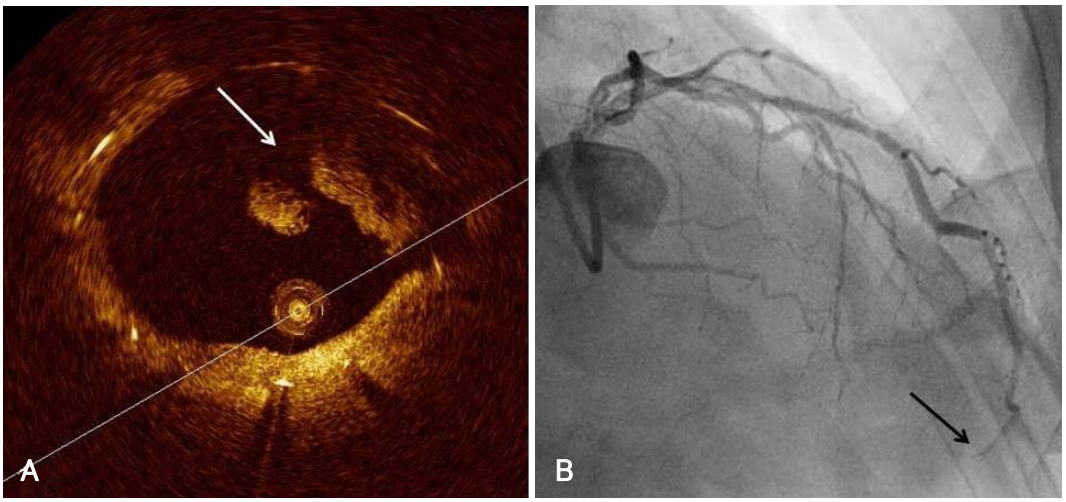

Fig. 4. Optical coherence tomography (OCT) revealed acute thrombus formation (white arrow) during the pull-back portion of the procedure (A). Follow-up coronary angiography after OCT showed total occlusion in the far distal segment of the left anterior descending (LAD) (dark arrow) (B) due to thromboembolism.

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