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Case Report

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Percutaneous Coronary Intervention for Spontaneous Coronary Artery Dissection under Intravascular Ultrasound Guidance

Michiya Kageyama*, Fumitake Yamauchi, Taito Masawa, Takahisa Nasuno, Masashi Sakuma, Shichiro Abe and Teruo Inoue

Abstract

A 77-year-old woman underwent percutaneous coronary intervention (PCI) for a spontaneous coronary artery dissection (SCAD) lesion in right coronary artery. A guide wire was advanced to the dissecting lesion, but it was inserted into false lumen. Therefore, we advanced an intravascular ultrasound (IVUS) catheter over the false lumen guide wire. The IVUS observation from the false lumen was useful for navigating the second guide wire into the true lumen. Finally, 38 mm everolimus-eluting stent was successfully placed in the dissecting lesion with fully coverage. The IVUS guidance such as in this case would be promising for the PCI in SCAD case.

Keywords

Spontaneous coronary artery dissection; Intravascular ultrasound; Coronary stent

Introduction

Spontaneous coronary artery dissection (SCAD) is infrequent but is becoming an increasingly recognized cause of acute coronary syndrome (ACS). Depending on the type and severity of SCAD, it may be treated conservatively or may require percutaneous coronary intervention (PCI) or coronary artery bypass grafting [1]. However, the optimal treatment strategy remains unknown. In this case report, we describe a patient with SCAD undergoing PCI, where intravascular ultrasound (IVUS) guidance was essential for successful treatment.

Case Report

A 77-year-old woman was admitted to our hospital to receive precise examination for abnormality of electrocardiogram, which showed an abnormal Q wave in lead III, an R/S voltage ratio >1 in lead V1, and inverted T waves in leads III, aVF, V5 and V6. Echocardiogram showed hypokinesis in the postero-inferior left ventricular wall. Both electrocardiogram and echocardiogram suggested postero-inferior old myocardial infarction, so we performed coronary angiography (CAG). The CAG showed extensive spiral dissection in the distal right coronary artery (RCA), and she was diagnosed with SCAD (Figure 1). Since exercise thallium-201 myocardial scintigraphy showed a perfusion defect and subsequent redistribution in the postero-inferior area, we thought her SCAD had an indication for PCI. The PCI was performed via a transradial approach using a 6F Amplatz left 1.0 guiding catheter (Profit AL1, Goodman, Nagoya, Japan). A guide wire (SION blue, Asahi Intec, Nagoya, Japan) was advanced to the dissecting lesion, but it was inserted into the false lumen. Repeated attempts failed to insert the guide wire into the true lumen. Therefore, we advanced an IVUS catheter (Eagle Eye, Volcano, San Diego, CA, USA) over the false lumen guide wire. The IVUS images showed the true lumen (Figure 2A). Then, a second guide wire (SION, Asahi Intec) was advanced to the lesion. Finally, we could successfully insert the second wire into the true lumen. We advanced the IVUS catheter again over the second guide wire in the true lumen. The IVUS images in the true lumen showed the length of the dissecting lesion (Figure 2B). Based on this finding, a 3.0×38 mm everolimus-eluting stent (Xience Xpedition, Abbott Vascular, Abbott Park, IL, USA) was placed in the dissecting lesion and fully covered it (Figure 3). The IVUS images did not show obvious atherosclerotic plaques in the RCA.

Discussion

In this case, SCAD was incidentally found without any symptoms representing myocardial ischemia. Electrocardiography and echocardiography suggested postero-inferior old myocardial infarction, and subsequent CAG identified SCAD. It has been reported that in most cases SCAD occurs as ACS, and frequently presents as ST elevation myocardial infarction (STEMI) [2], so cases such as ours seem to be rare.

Retrospective registry studies have reported that SCAD is detected in 0.07% to 1.1% of all patients undergoing CAG [3-5]. The SCAD affects a young, predominantly female population. Fibromuscular dysplasia is a novel association and potentially causative factor for SCAD in addition to atherosclerotic disease [2,3,6,7]. Recently, we reported that SCAD was evident in 10 (0.86%) of 1159 ACS patients hospitalized in our hospital from March 2001 to November 2012 [8]. The mean age of these patients was 46 years, and 9 were female. STEMI was observed in 9 patients (90%). Although 5 patients (50%) had no coronary risk factors, fibromuscular dysplasia could not be confirmed in any of these patients. It is often difficult to discriminate a "non-atherosclerotic" coronary artery dissection from an "atherosclerotic" dissection, especially in elderly patients or patients with coronary risk factors. Our case was an elderly female (77 years) and she had risk factors such as hypertension and dyslipidemia, so we considered that atherosclerotic factors could be related to the onset of SCAD, although obvious atherosclerotic plaques were not seen in the IVUS images.

The optimal treatment strategy for acute SCAD remains uncertain. In acute phase dissection, less invasive treatment may be favorable, because the coronary vessel wall in patients with SCAD seems to be fragile. In such cases, PCI itself has a risk of dissection progression or luminal occlusion by a hematoma. In the present case, however, the SCAD was found as the cause of an old myocardial infarction, and the

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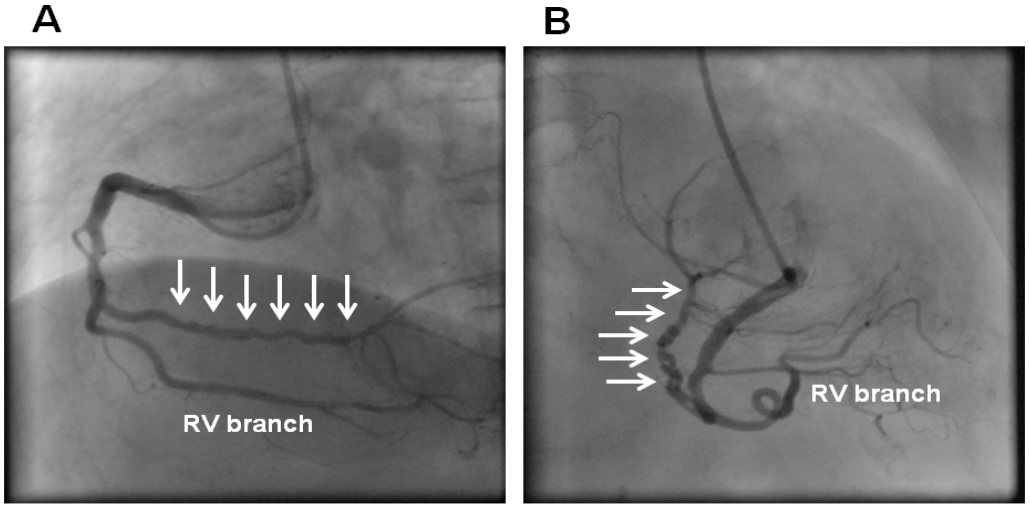

Figure 1: Coronary angiography. **(A)** Left anterior oblique 60° projection, **(B)** Right anterior oblique 40° and cranial 30° projection. Extensive spiral dissection was observed in the distal right coronary artery. RV branch=Right ventricular branch.

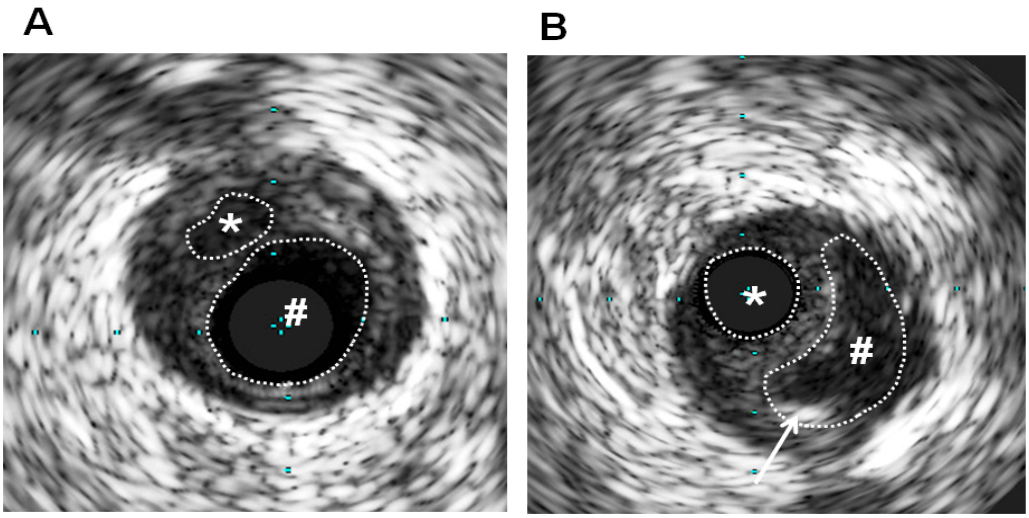

Figure 2: Intravascular ultrasound (IVUS) imaging at the site of coronary artery dissection in the right coronary artery. **(A)** The IVUS catheter was advanced over the guidewire inserted into the false lumen. **(B)** The IVUS catheter was advanced again over a second guidewire inserted into the true lumen. The first guidewire inserted into the false lumen was observed (arrow). * - true lumen, # - false lumen.

onset time of the SCAD was unclear. Since PCI in SCAD primarily aims to terminate progression of SCAD and ultimately to prevent occlusion of the vessel in acute stage, there might be an option of conservative treatment for such a chronic stage SCAD patient as this patient. In this patient, however, viability in the infarct area was evident by thallium-201 myocardial scintigraphy, so we selected PCI as the therapeutic strategy, and a 3.0×38 mm everolimus-eluting stent was placed in the dissecting lesion. During the course of PCI, it was very difficult to advance the guide wire into the true lumen. Every attempt resulted in insertion of the guide wire into the false lumen. Therefore, we decided to advance the IVUS catheter over the false lumen guide wire. Then we used a low tip load guide wire (SION blue) to avoid the progression of dissection. Finally, the second guide wire was successfully inserted into the true lumen under IVUS guidance. When the IVUS catheter was passed over the true lumen guide wire, the dissecting lesion length could be determined.

Drug-eluting stents seem not to be necessary for SCAD, because patients with SCAD have less coronary atherosclerotic plaques and less coronary risk factors; thus, the risk of restenosis would be low in general. In addition, drug-eluting stents has the concern about delayed wound healing in the stent-injured vessel wall. Furthermore, long-term dual antiplatelet therapy after drug-eluting stent implantation may disturb the thrombus formation within the false lumen. In the present case, however, we selected an everolimus-eluting stent for 2 reasons. One is that atherosclerosis could be a factor related to SCAD, because the patient had several risk factors for atherosclerosis. The other is that we aimed to place a single stent that would fully cover the spiral dissecting lesion. For that purpose, we needed a long stent such as a 38-mm everolimus-eluting stent, and the information provided by IVUS was helpful in selecting this stent.

Recently, Satogami et al. [9] reported a SCAD case with successful short spot stenting with optical coherence tomography guidance to

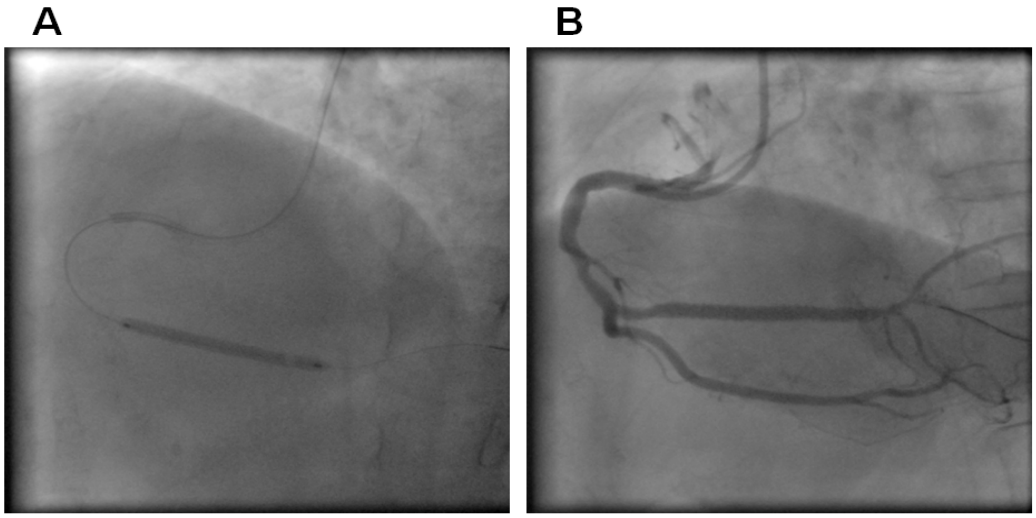

Figure 3: Coronary stent implantation with a 3.0×38-mm everolimus-eluting stent in the dissecting lesion. **(A)** During stent dilatation. **(B)** Final result. The stent was successfully placed, fully covering the lesion.

close the entry of dissection in the ostium of right coronary artery. In this case, one long everolimus-eluting stent implantation with IVUS guidance was performed for covering the whole length of dissection, although the entry of dissection was observed by IVUS. Anyway, we believe that IVUS guidance greatly contributed to the success of PCI in this case.

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