Successful Non Contrast Percutaneous Coronary Intervention for Patient with Unstable Angina and Prior Anaphylactic Reaction to Iodinated Contrast Medium

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Abstract

A 53-year-old man, who had a history of angina treated by percutaneous coronary intervention without allergic reaction to contrast and coronary bypass surgery, was hospitalized due to epigastralgia and tarry stool. During an enhanced computed tomography for the evaluation of abdominal diseases, he became hypotensive and had chest pain. To diagnose acute coronary syndrome, coronary angiography (CAG) was performed after the intravenous administration of hydrocortisone. He became hypotensive again during the CAG, which revealed significant coronary artery stenosis in the right coronary artery. Despite the intensive medical treatment, he had angina even while walking in the ward. By using an intravascular ultrasound for coronary stent implantation and the second wire as a marker for the stent implantation, we performed coronary interventional procedures successfully for this patient without the use of iodinated contrast media.

Key words: anaphylaxis, coronary intervention, iodinated contrast media, intra vascular ultrasound (IVUS)

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Introduction

More than 70 million diagnostic radiographic examinations using iodinated contrast media (ICM) are performed worldwide each year (1). Anaphylactoid reactions to ICM are one of the common complications during these examinations. Clinical manifestations of systemic anaphylaxis include various combinations of flushing, urticaria laryngeal edema, and hypotension. The incidence of a severe reaction such as shock is extremely low (less than one death per 100,000 patients) (2-7). However, ICM-related adverse reactions should be prevented and appropriately treated when they do occur. This is our first report of successful percutaneous coronary intervention (PCI) without the use of ICM in a patient with unstable angina and prior systemic anaphylaxis to ICM.

Case Report

A 53-year-old man, who had a history of hypertension

and angina pectoris, received coronary angiography (CAG) including percutaneous coronary intervention (PCI) with ICM (Iomeron 350TM, Eisai, Tokyo, Japan) 5 times and a coronary artery bypass graft (CABG) surgery. He had never experienced an ICM allergy before. PCI with bare metal stent (BMS) was performed for the 75% stenosis of the mid left circumflex artery (Lcx) on May, 2004. However, the stenotic lesions of all three coronary arteries progressed afterwards. Follow-up CAG revealed chronic total occlusion (CTO) in the proximal left anterior descending artery (LAD), in-stent 75% restenosis in the proximal Lcx and 50% stenosis in the mid right coronary artery (RCA) in November, 2004. Therefore, he underwent CABG in December, 2004, receiving a left internal mammary artery (LIMA) to Lcx and right internal mammary artery (RITA) to LAD in another hospital. Follow-up CAG revealed that RITA to LAD was patent, but the LIMA graft was totally occluded. We successfully performed PCI for in-stent 75% restenosis in the proximal Lcx by using cutting balloon in July, 2005. Afterwards he had no angina attacks.

He was hospitalized due to epigastralgia and tarry stool in

Figure 1. Previous coronary angiographic findings of the right coronary artery (A) and those obtained from the hospitalization for epigastralgia and tarry stool (B). Severe stenotic lesions were demonstrated at the proximal and the middle portion of right coronary artery, which had obviously progressed compared to the lesions on the earlier angiograms (arrows denoted significant stenosis).

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The hemoglobin value was 11.0 mg/dL on admission, and was slightly decreased from the previous value (12.6 mg/dL). During computed tomography with 100 mL of ICM [Optiray 320TM, (Ioversol), Tyco Healthcare, Tokyo, Japan] for abdominal evaluation, his blood pressure dropped from 110 mmHg to 60 mmHg suddenly with chest pain, dyspnea, and flushing lasting approximately 10 minutes. We diagnosed him as shock due to systemic anaphylaxis to ICM, however, could not completely exclude the contribution of coronary ischemic event. We thus performed CAG using ICM which we safely used for him before (Iomeron 350TM, Eisai, Tokyo, Japan) after an intravenous administration of hydrocortisone 500 mg. However, his blood pressure decreased to 50 mmHg again for 10 minutes at the end of the CAG. We immediately administered epinephrine (1:1,000) 0.5 mg intramuscularly, diphenhydramine 50 mg and hydrocortisone 500 mg intravenously, and subsequently infused 1,000 mL of lactated Ringer solution rapidly. After recovery, we completed CAG using 35 mL of ICM and found significant 75% and 90% stenosis at the proximal and middle regions of the right coronary artery (RCA), but no significant stenosis at the left anterior descending (LAD) and left circumflex (Lcx) coronary artery (Fig. 1).

Despite the intensive medical treatment, he had angina attacks even while walking in the ward. PCI was performed using intravascular ultrasonography (IVUS) without using ICM. To prevent anaphylaxis, we administered him prednisone 20 mg orally before 13 hours, 7 hours, and 1 hour and diphenhydramine 50 mg parenterally 1 hour before the procedures as premedication. During the PCI procedure, a 6Fr JR 4.0 guiding catheter (Cordis, NJ, USA) was positioned at the ostium of the RCA. A 0.014-inch Rinato guidewire (Terumo, Tokyo, Japan) was advanced into the distal RCA and a 0.014-inch Route guidewire (Asahi Intec, Aichi, Japan) was also put into the right ventricular branch (RV) as a

marker for stent implantation (Fig. 2). IVUS imaging using 40 MHz Atlantis IVUS catheter (Boston Scientific, Natick, MA, USA) demonstrated moderate calcification in the proximal and the mid RCA. Pull-back speed was set at 0.5 mm/sec to measure the accurate length of the stenotic lesion by IVUS system. Pre-dilation before stenting was performed using a 2.75×20 mm Splinter balloon catheter (Medtronic, MN, USA). By using IVUS guide for stenting and the second wire as a marker for the implantation of coronary stent, we carefully implanted a 3.0×32 mm stent (Taxus ExpressTM, Boston Scientific, Natick, MA, USA) and the final IVUS imaging showed successful results (Fig. 3). We found by gastric endoscopy that the cause of tarry stool was a small gastric ulcer. Fortunately, it was at the healing stage and we could choose a drug eluting stent.

Discussion

Under the guide by IVUS images, PCI could be successfully performed without using ICM in a patient with unstable angina and prior anaphylactic shock to ICM. We employed 3 therapeutic strategies to perform PCI successfully and safely for this patient. First, we used previous CAG findings for the basis of the information about the lesion of location and length for performing PCI, which enabled us to easily confirm the relationship between the stenotic lesion and the side branch. We also could identify the stenotic lesion of the mid RCA located at the right ventricular branch (RVB). Second, we advanced one wire into the distal RCA and another wire into the RV branch, which was located around the second stenosis at the mid portion of RCA, as a marker for the implantation of coronary stent. Third, we used IVUS imaging, which allowed not only measurement of the diameter of the vessel and view of the characteristics of the lesion such as calcification and attenuated plaque, but also facilitated careful determination of the stent length and

Figure 2. (A) The second wire was advanced into the right ventricular branch (arrows), which was located around the second stenosis at the mid portion of RCA. This wire was used as one of the markers for stenting. (B) A Taxus Express™ Stent (PES) was implanted under the guidance of the IVUS and the second wire. The second wire was removed carefully just before the stent dilation.

Figure 3. Intracoronary ultrasound (IVUS) imaging: (Upper: longitudinal view, Lower: axial view). (A) Pre-procedural IVUS revealed two stenotic lesions, located at the proximal (circle of a solid line) and the middle (circle of a dotted line) portion of right coronary artery. (B) Post-procedural IVUS image demonstrated the optimal results.

the location. We were able to readily place the stent by marking the initiation and termination of the lesion by a cineradiography using a binary marker at the tip of IVUS. Moreover, after implanting the coronary stent, we could check for the possible presence of injury or hematoma at the edge of the stent. However, IVUS-guided PCI without the use of ICM may cause complications including distal wire-injury or slow / no flow phenomenon due to distal embolism, which may occur with the use of the polymer jacket wire in particular. Moreover, the slow/no flow phenomenon can be diagnosed only by the symptoms of the patient or based on the findings of electrocardiograms.

Patients who have experienced an anaphylactoid reaction to ICM are at greatest risk to suffer another episode as seen in the present patient. In such patients with recurrent systemic anaphylaxis, prophylactic use of histamine 1 receptor antihistamine is beneficial (8, 9). Prednisone orally or intravenous (may also reduce the risk of recurrent anaphylaxis). However, it is necessary to understand that prednisone is not effective if given less than 6 hours before ICM due to its slow acting property. Furthermore, some controlled clinical trials have already revealed the combination of prednisone and histamine 1 receptor antihistamine to be the most beneficial in preventing anaphylactoid reactions to ICM (8, 9). In addition, ephedrine, which is used as a bronchodilator of the β_2 receptor stimulant, has been sometimes added in a few clinical trials (8). However, the addition of ephedrine to decrease the prevalence of adverse reactions to ICM has not gained wide acceptance. Ephedrine is contraindicated for uncontrollable hypertension and unstable angina because it also releases norepinephrine from sympathetic nerve endings, which makes α - and β_1 -adrenergic stimulants activate (10). Based on these findings, we did not administer ephedrine to our patient.

The availability of newer low- and iso-osmolar nonionic contrast agents adds a further margin of safety since the rate of severe cross-reaction with prior reaction to an ICM is also high. For this indication, the true nonionic agents are preferable. We did not use the "generic" contrast in this patient which may contain ingredients which cause anaphylactoid reactions. Even though this patient received the same original nonionic contrast agents which we had used many times before, he had anaphylactoid shock during the CAG.

In patients with a severe prior allergic reaction to ICM, the use of gadolinium chelates may be considered in place of ICM. In fact, several reports have demonstrated that gadolinium chelates could be an alternative contrast media during PCI in particular patients with prior allergy to ICM (11, 12). The prevalence of anaphylactoid reactions to gadolinium chelates is reported to be extremely low at 0.0002-0.001%. However, the risk of adverse reactions may increase by 3 to 4 fold in patients with a history of anaphylactoid reaction to ICM (12, 13). In addition, another limitation of gadolinium is its low radiopacity. Moreover, gadolinium chelates have adverse effects including nephritic systemic fibrosis especially for patients with renal dysfunction. Therefore, we performed the PCI under the guide of IVUS along with anaphylactoid prophylaxis beforehand. In the case that some complications, such as a slow flow/ no flow, may occur with chest pain or the disturbance of vital signs, we had planned to perform coronary angiography immediately with the use of ICM to confirm the diagnosis. In the case of an emergency, we had the approach to prevent a slow flow/ no flow phenomenon including the use of intracoronary infusion of verapamil, diltiazem, adenosine, or nitroprusside at the time of the procedure (14, 15). Nevertheless, it is important to emphasize again that the prevention of the contrast allergy in advance is extremely cardinal.

Oxygen supplementation, intravenous administration of physiological fluids and intramuscular injection of 0.3 to 0.5 mg epinephrine (1:1,000) should be considered in the first line of management of acute anaphylaxis.

In conclusion, PCI could be successfully and safely performed for a patient with unstable angina and prior anaphylactic shock to ICM under IVUS guide and the second wire as a marker for coronary stenting.

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