Primary Percutaneous Coronary Intervention by a Stentless Technique for Acute Myocardial Infarction with Idiopathic Thrombocytopenic Purpura: A Case Report and Review of the Literature

Susumu Fujino, Satoru Niwa, Kensuke Fujioka, Tomohito Mabuchi, Yoshihiro Noji, Masato Yamaguchi and Takahiko Aoyama

Abstract

A 78-year-old man who had been diagnosed with idiopathic thrombocytopenic purpura (ITP) was admitted to our hospital with chest pain, cold sweating and nausea. An electrocardiogram and echocardiogram revealed an ST elevated acute lateral myocardial infarction. He underwent an immediate cardiac catheterization. An occluded left circumflex artery was detected by coronary angiography. Reperfusion was performed successfully by non-slip element balloon angioplasty alone, without stenting, to avoid prolonged dual anti-platelet therapy. In this report we discussed the management strategies of acute myocardial infarction in a patient with concomitant ITP.

Key words: myocardial infarction, idiopathic thrombocytopenic purpura, percutaneous coronary intervention, coagulation disorder, Lacrosse non slip element balloon, a balloon catheter with 3 nylon elements


Introduction

Idiopathic thrombocytopenic purpura (ITP), also termed immune thrombocytopenia is an autoimmune disorder characterized by a decreased platelet count (<100,000/μL) and mucocutaneous bleeding resulting from antibody-mediated reduced platelet survival and immune-mediated ineffective thrombopoiesis. Only a small number of cases of primary percutaneous coronary intervention (PCI) have been reported in acute myocardial infarction (AMI) patients with concomitant ITP, because these patients are rarely encountered in the clinical setting. For this reason, the best treatment for AMI with concomitant ITP has not been well established. Thrombolytic therapy is contraindicated in these patients. In the stent era, which is increasingly becoming the drug eluting stent (DES) era, patients require prolonged dual anti-platelet therapy (DAPT) to prevent stent thrombosis (ST). It has been reported that the temporary discontinuation of antiplatelet therapy could not be avoided due to the exacerbation of ITP during the clinical course after PCI with a bare metal stent (BMS) and a DES (5, 13). Therefore, we have to carefully consider the treatment of patients with AMI with concomitant ITP.

Case Report

We herein report the case of a 78-year-old man who experienced AMI with concomitant ITP and who was treated successfully by non-slip element (NSE) balloon angioplasty. The patient was diagnosed with ITP two years prior to the onset of AMI, and was referred to our hospital from another hospital for treatment with insulin therapy due to worsened type 2 diabetes mellitus. The patient was also diagnosed with hypertension and dyslipidemia, and had been treated with prednisolone for ITP. An exercise stress electrocardiogram (ECG) revealed ischemic changes without any symptoms such as chest pain. Exercise stress 99mTc methoxyisobu-

Department of Cardiology, Fukui Prefectural Hospital, Japan
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Correspondence to Dr. Susumu Fujino, susumufujinoMD@gmail.com
tylisonitrile (MIBI) myocardial perfusion imaging (MPI) showed stress induced inferolateral myocardial ischemia. Coronary angiography revealed moderate significant stenosis in the middle of left circumflex artery (LCx), although no significant stenosis was observed in the left anterior descending artery (LAD) or the right coronary artery (RCA). The patient preferred to be treated with only medical therapy instead of PCI; because he had no subjective symptoms such as chest pain and due to concerns about the risk of bleeding following antiplatelet therapy after the deployment of a coronary metallic stent. He underwent insulin therapy, antihypertensive therapy and prednisolone treatment, but he decided to discontinue all of these treatments (based on his own judgment) at 6 months before the first cardiac event.

Two years later, he was admitted to the emergency room (ER) of our hospital due to chest pain, cold sweating and nausea. ST segment elevation was confirmed on the monitor leads of an ECG in an ambulance. He was still experiencing chest pain and cold sweating on his arrival at the ER, but his vital signs were all stable. His blood pressure and heart rate were 148/75 mmHg and 76 bpm, respectively. Cutaneous purpuras were observed in some places, but petechiae and mucosal bleeding were not noted. The heart and lung examinations were unremarkable and hepatosplenomegaly was not observed. The 12 leads of the ECG revealed not only an inverted T wave in the II, III and AVF leads but also ST depression in the V5 and V6 leads (Fig. 1). The laboratory findings revealed strong positivity for heart type fatty acid-binding protein [H-FABP, 16.5 ng/mL (normal range: <6.2)], the serum analysis revealed the following findings: platelet count, 47,000/μL; WBC count, 6,900/μL; RBC count 4.34*10⁶/μL; and Hb level, 13.1 g/dL. He was diagnosed with AMI, and 200 mg aspirin was administered orally. The patient was immediately transferred to the catheterization laboratory where 5,000 IU of unfractionated heparin was administered prior to coronary angiography. The right radial artery was accessed with a 6 French sheath to avoid excessive bleeding and to obtain hemostasis easily. However, it was too torturous to engage the right subclavian artery with a diagnostic catheter for coronary artery through the right radial approach. We thus changed the approach site to the right femoral artery. Angiography revealed the total thrombotic occlusion of LCx (Fig. 2) and a severe stenotic lesion in the proximal portion of RCA (Fig. 3), while no significant stenosis was detected in the LAD. On the assessment of LCx as a culprit lesion, we performed PCI for LCx. After crossing the total occlusion with a 0.014 inch wire (Runthrough NS™, Termo, Tokyo, Japan), a large thrombus was confirmed by angiography. The lesion was aspirated us-

**Figure 1.** An electrocardiogram presented not only an inverted T wave in the II, III and AVF leads, but also ST depression in the V5 and V6 leads when the patient was admitted to the emergency room with chest pain.

**Figure 2.** The baseline left coronary angiograms in an RAO caudal projection showed a total occlusion with some thrombus in the middle of left circumflex artery.
ing a thrombectomy catheter (Export Advance™, Medtronic, Minneapolis, USA) and achieved thrombolysis in myocardial infarction (TIMI) grade III flow (Fig. 4). Intravascular ultrasound (IVUS) imaging was performed after pre-dilation with a 2.0/20 mm balloon (Tenku™, St. Jude Medical, St. Paul, USA). NSE (Lacrosse NSE™, Goodman, Nagoya, Japan) balloon angioplasty was performed with a 3.0/13 mm, and subsequent angiography demonstrated optimal myocardial contrast blush without dissection (Fig. 5), which was also evaluated by IVUS. After restoration of the blood flow, the chest pain resolved. Following the procedure, the patient was transferred to the coronary care unit (CCU) and treated with aspirin (100 mg/day), bisoprolol (0.625 mg/day), azilsal tan (10 mg/day), atorvastatin (10 mg/day) and prednisolone (10 mg/day). Clopidogrel was not used in this case because of the stentless PCI approach, and unfractionated heparin was administered (10,000 IU/day) for 3 days. The peak CK and CK-MB levels were 234 U/L and 11.3 ng/mL, respectively, and the cardiac troponin T level was 0.297 ng/mL (Normal: <0.014) at 18 hours after emergent PCI. The sheath introducer from the right radial artery was removed immediately after PCI using a device to assist hemostasis (TR Band™, Terumo). The sheath introducer was removed from the right femoral artery on the next day, and manual compression was carefully applied by hand for one hour. We noted a small ecchymosis around the puncture site of radial artery, but no hematoma or ecchymosis was noted in case of the femoral artery. No other bleeding complications occurred. Although the platelet counts were reduced to 36,000/μL the day after PCI, they were subsequently stabilized at about 40,000/μL, resulting in no major bleeding or mucosal bleeding. The patient was monitored in the CCU for 4 days and transferred to a general ward. Tests for the IgG of Helicobacter pylori, and hepatitis C and HIV antibodies were all negative. Later, tests for the markers of antiphospholipid syndrome, such as lupus anticoagulant (LA), anticardiolipin beta-2-glycoprotein I antibodies (anti-CLβ2GP antibodies) were all negative. Since pharmacological stress 99mTc MIBI MPI showed stress-induced myocardial ischemia in the inferior wall and a mild perfusion defect in the lateral wall 2 weeks after the procedure, we planned PCI for the severe stenotic lesion of the proximal site of right coronary artery. PCI was performed with a stentless technique in the same way, and the patient was discharged on aspirin (100 mg, daily). The platelet level on discharge was 45,000/μL without prednisolone. Angiographic follow-up at 6 months later revealed no restenosis (Fig. 6). He was chest pain free and his recovery was uneventful and without active bleeding more than one year after intervention.

Discussion

ITP is characterized by a low platelet count and mucocutaneous bleeding. The disorder can best be considered as a syndrome due to its varied pathogenesis, resulting in a common phenotype of thrombocytopenia with mucocutaneous bleeding. In addition, it is also termed ‘secondary ITP’ if it is associated with an infection such as Helicobacter pylori,
implanted in only one patient (13). Balloon angioplasty ranging from 5,000/μL (10) to 78,000/μL (5). A DES was deployed, was performed with different platelet counts, women. PCI, which was generally undertaken by BMS deployment, was successfully performed in two cases (2, 6).

The point of our case is that the culprit lesion of the patient’s AMI patient was treated with a stentless PCI approach. Other residual lesions were also treated with a stentless technique. In cases where the lesion morphology is relatively simple, NSE balloon angioplasty should probably be considered as the first line treatment for AMI patients with concomitant ITP. We prescribed only aspirin for the patient after PCI (clopidogrel was not used). He was free from ischemic events and without bleeding. A follow-up angiogram revealed no restenosis in either of the two treated lesions. BMS deployment is considered when other treatments of a lesion achieve suboptimal results, since acute occlusion of the culprit lesion is a matter of concern. Thus far, only 2 cases have been reported where AMI with concomitant ITP was treated with plain old balloon angioplasty (POBA) instead of the deployment of a coronary stent (2, 6). However, in one case, re-infarction occurred 9 hours after the initial PCI.

There are two problems involved in the treatment of AMI patients with concomitant ITP: anti-platelet therapy and the control of platelet counts for the prevention of bleeding. A coronary metallic stent could improve success rate of PCI for AMI due to decrease of acute coronary occlusion. Furthermore, the use of a DES, rather than a BMS, for AMI has been found to reduce the incidence of target-vessel failure (19). The difference was mainly driven by a reduction in the incidence of target-vessel revascularization. However, patients treated with a coronary metallic stent need DAPT in order to prevent ST. The combination of aspirin and thienopyridine derivatives is essential for minimizing the risk of ST, in particular, prolonged DAPT is necessary for patients who are treated with a DES. Although Kotani et al. reported that DAPT performed beyond 12 months was associated with an increased risk of bleeding and that it was not possible to prevent the incidence of major adverse cardiac events (MACE) in patients with sirolimus eluting stents (SES) (20), the Japanese Circulation Society guidelines for the management of patients with ST elevated myocardial infarction (STEMI) recommend at least 1 month of DAPT for BMS patients and 12 months for DES patients (21). However, this recommendation could possibly have been greatly disadvantageous in the case of the AMI patient with concomitant ITP. Child ITP is essentially a self-limiting disease. On the other hand, adult ITP tends to be more difficult to remit and the clinical course occasionally involves relapses. Stouffer et al. reported the case of an AMI patient with concomitant ITP who underwent BMS deployment, in which diffuse petechiae and a spontaneous nose bleed developed three weeks after treatment (5). In this case, clopidogrel was discontinued and aspirin was temporarily suspended (for 4 days). Torbey et al. reported the case of a patient who presented with relapsed thrombocytopenia and was readmitted with mucosal hemorrhagic blisters (13). All antiplatelets were discontinued and intravenous steroids and intravenous immunoglobulins (IVIG) were administered. BMS should be recommended in order to minimize the period for which clopidogrel is administered (14). DES should only be implanted in high risk cases such as diffuse long lesions, small vessels and poorly controlled diabetes.

Taguchi et al. reported that the clinical outcome of NSE balloon angioplasty was better than that in a statistically matched DES group with low risk factors and simple target lesions (22). Lesional dilation under surgical incisions can be expected to reduce hoop stress during the dilation, resulting in plaque reduction and a larger luminal gain. The target lesion revascularization (TLR) rate (9.6% vs. 6.5%, p=0.616) and late lumen loss (0.52±0.26 mm vs. 0.48±0.21 mm, p=0.347) were comparable. These results suggest that NSE balloon angioplasty alone, which is an applicable approach even in the DES era, is expected to result in the achievement of a DES-equivalent TLR rate, when the stentless technique is considered to be suitable for patients and lesions. Most expert opinions recommended BMS placement as opposed to DES to minimize the duration of DAPT in case bleeding occurs (23). We believe that this approach is also applicable for the patients suffering from coronary
artery disease before non-cardiac surgery.

The other problem, which we already mentioned is the control of platelet counts before PCI. Since severe bleeding is uncommon when the platelet count is above 30,000/μL, treatment is usually initiated when the count falls below 30,000/μL (24). Antiplatelet therapy and heparin can be used with relative safety when the platelet count is above 30,000/μL in the absence of bleeding (14). Any treatments should be carefully considered when the platelet count is <20,000-30,000/μL (1). Although IVIG leads to a rapid rise in platelet count and plasma viscosity, IVIG sometimes induces thromboembolic events including myocardial infarction during or shortly after infusion (6, 13, 14, 25, 26). This finding is probably due to the rapid rise in younger and more reactive platelets in response to this therapy in concomitant ITP, which may potentially aggravate high plasma viscosity related adverse effects. Therefore, caution should be taken when administering IVIG. A previous report indicated that major bleeding occurred in only one case in a series of AMI patients with concomitant ITP during the perioperative period, even though the platelet counts were low (2). The indications of IVIG should thus be limited to cases of a low platelet counts (<20,000/μL) or when signs of bleeding are observed.

Our case suggests the feasibility of PCI by a stentless approach with NSE balloon angioplasty in AMI patients with concomitant ITP, to minimize the risk of bleeding and thrombosis, even in the DES era.

The authors state that they have no Conflict of Interest (COI).

References


### Table. Case Reports of AMI with Concomitant ITP in which Primary PCI Was Performed.

<table>
<thead>
<tr>
<th>Reference No.</th>
<th>Nationality</th>
<th>Age</th>
<th>Gender</th>
<th>Device</th>
<th>Platelet count/μL</th>
<th>Major bleeding</th>
<th>Anti-platelet therapy</th>
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<tr>
<td>2</td>
<td>Japan</td>
<td>72 F</td>
<td></td>
<td>POBA</td>
<td>59,000 Yes</td>
<td>Ethylicosapentate</td>
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<tr>
<td>3</td>
<td>UK</td>
<td>49 M</td>
<td></td>
<td>BMS</td>
<td>41,000 No</td>
<td>DAPT</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Japan</td>
<td>68 F</td>
<td></td>
<td>BMS</td>
<td>22,000 No</td>
<td>Ticlopidine</td>
<td></td>
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<tr>
<td>5</td>
<td>USA</td>
<td>77 M</td>
<td></td>
<td>BMS</td>
<td>78,000 No</td>
<td>DAPT</td>
<td></td>
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<tr>
<td>6</td>
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<tr>
<td>7</td>
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<td>47 F</td>
<td></td>
<td>BMS</td>
<td>21,000 No</td>
<td>DAPT</td>
<td></td>
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<tr>
<td>8</td>
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<td>34,000 No</td>
<td>Clopidogrel</td>
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<td></td>
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<td>39,000 No</td>
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<td>80 M</td>
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<tr>
<td>11</td>
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<td>23 F</td>
<td></td>
<td>BMS</td>
<td>35,000 No</td>
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<td></td>
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<tr>
<td>12</td>
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<td>BMS</td>
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<tr>
<td>13</td>
<td>USA</td>
<td>55 M</td>
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<td>DES</td>
<td>42,000 No</td>
<td>DAPT</td>
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</tr>
<tr>
<td>14</td>
<td>Israel</td>
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<td>BMS</td>
<td>29,000 No</td>
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<td></td>
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<tr>
<td>Current case</td>
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<td>78 M</td>
<td></td>
<td>NSE</td>
<td>41,000 No</td>
<td>ASA</td>
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</tr>
</tbody>
</table>

POBA: Plain old balloon angioplasty, BMS: Bare metal stent, DES: Drug eluting stent, DAPT: Dual antiplatelet therapy, ASA: Acetylsalicylic acid, NSE: Non-slip element balloon


