*Case Reports*

# Primary Percutaneous Coronary Intervention

## for ST-Segment-Elevation Myocardial Infarction in a Patient Taking Dabigatran for Chronic Anticoagulation

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*Interventional cardiologists have few data on which to base clinical decisions regarding optimal care for ST-segment-elevation myocardial infarction patients who are taking therapeutic chronic oral anticoagulation. We present what we believe to be the first reported case of emergency coronary angiography and primary percutaneous coronary intervention in an ST-segment-elevation myocardial infarction patient who was on a dabigatran regimen for atrial fibrillation. The patient tolerated the procedures well and had no observable bleeding sequelae. In addition to the patient's case, we discuss the current evidence regarding the periprocedural management of oral anticoagulation in patients who need coronary angiography and percutaneous coronary intervention.* ***(Tex Heart Inst J 2015;42(2):158-61)***

Results of clinical trials have established primary percutaneous coronary intervention (PCI) as the preferred means of emergency revascularization for patients who have sustained an ST-segment-elevation myocardial infarction (STEMI). To date, all randomized trials involving primary PCI for STEMI have excluded patients who are taking chronic oral anticoagulant (OAC) medications. Accordingly, no data describe how best to treat patients on uninterrupted OAC therapy who present with STEMI. We report what we believe to be the first case of emergency coronary angiography and primary PCI for STEMI in a patient on chronic dabigatran therapy.

***Key words:*** *Anticoagulants/administration & dosage/adverse effects/therapeutic use; clinical protocols/standards; medication therapy management/standards; myocardial infarction/therapy; myocardial revascularization; percutaneous coronary intervention; risk assessment; thrombolytic therapy; treatment outcome*

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## Case Report

In January 2013, a 71-year-old man presented at the emergency department with retrosternal chest pain that had begun approximately 2 hours earlier. The patient's medical history included paroxysmal atrial fibrillation, hypertension, emphysema, and hyperlipidemia. He had no history of stroke or transient ischemic attack. His medications included dabigatran etexilate (150 mg twice/d) and metoprolol tartrate (25 mg twice/d). On physical examination, the patient was a moderately obese man in mild distress, with a blood pressure of 156/94 mmHg and a pulse rate of 79 beats/min. Cardiac examination revealed an irregularly irregular rhythm without murmurs or gallops. Results of an Allen test of the patient's right hand were deemed suboptimal for radial cannulation; however, his femoral and pedal pulses were readily palpable. The examination results were otherwise not noteworthy.

A 12-lead electrocardiogram showed atrial fibrillation with incomplete right bundle branch block, 3-mm ST-segment elevation in leads III and aVF, and 2-mm ST elevation in lead II. These findings were consistent with an acute inferior-wall STEMI (Fig. 1).

In the emergency department, the patient was given 324 mg of chewable aspirin and was started on an intravenous nitroglycerin infusion. He was urgently transported to the cardiac catheterization laboratory, where coronary angiography was performed via the right femoral artery approach through a single wall puncture with use of a 6F sheath. Cineangiographic images revealed thrombotic occlusion of the proximal segment of the right coronary artery with Thrombolysis in Myocardial Infarction (TIMI)-0 flow (Fig. 2). The left main, left anterior descending, and left circumflex coronary arteries had nonobstructive disease. The initial activated clotting time (ACT) was 128 s. The patient was given a 180-mg oral loading dose of ticagrelor, along with an 0.75-mg/kg intravenous bolus dose of bivalirudin followed by a continu-



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ous infusion of 1.75 mg/kg/hr. Emergency primary PCI included aspiration thrombectomy, balloon angioplasty, and placement of a 4 × 24-mm VeriFLEX™ Bare-Metal Coronary Stent (Boston Scientific Corporation; Natick, Mass). This resulted in TIMI-3 flow with no sequelae (Fig. 3). Left ventriculograms revealed an ejection fraction of approximately 0.50 and showed a small area of inferior-posterior hypokinesia. Access-site hemostasis was achieved with use of a 6F AngioSeal™ device (St. Jude Medical, Inc.; St. Paul, Minn). Blood specimens drawn while the patient was in the catheterization laboratory revealed normal renal function, hemoglobin, and platelet count. The prothrombin time was 23.6 s (normal range, 11.5–14.7 s) with an international normalized ratio (INR) of 2.2 (normal range, 0.8–1.1) and an activated partial thromboplastin time of 72 s (normal range, 23.6–36.5 s). The patient's initial troponin I level was 8.73 ng/mL (normal, <0.05 ng/dL). No hematoma or clinically significant bleeding was encountered. The patient's hemoglobin levels remained stable postprocedurally. Dabigatran was discontinued in favor of intravenous unfractionated heparin and oral warfarin. The patient had an uneventful recovery and was discharged on the 3rd hospital day with instructions to take oral aspirin (81 mg/d), ticagrelor (90 mg twice/d, with plans to change to antiplatelet monotherapy after 1 mo), atorvastatin (80 mg/d), metoprolol tartrate (50 mg twice/d), and warfarin to maintain an INR of 2 to 2.5. During 2 follow-up visits, the patient reported no symptoms and was compliant in taking the prescribed medications.

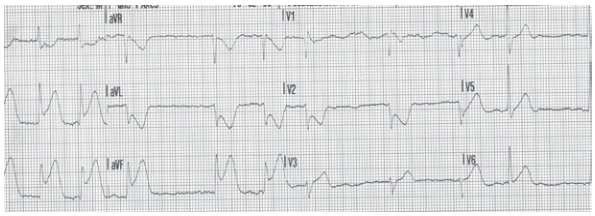


***Fig. 1*** *Initial 12-lead electrocardiogram shows ST-segment elevation in the inferior leads.*

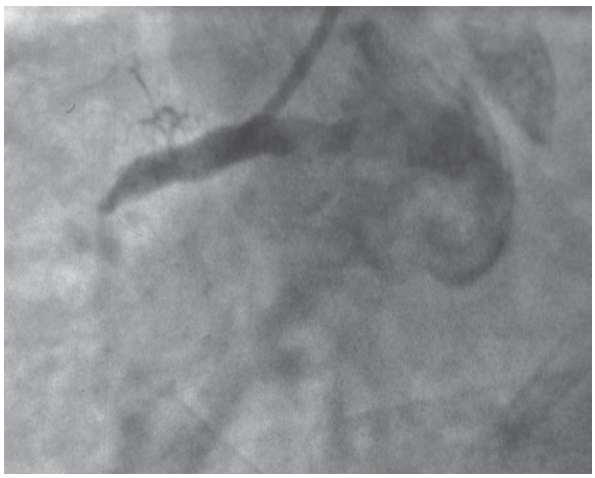

***Fig. 2*** *Coronary angiogram shows thrombotic occlusion of the proximal segment of the right coronary artery.*

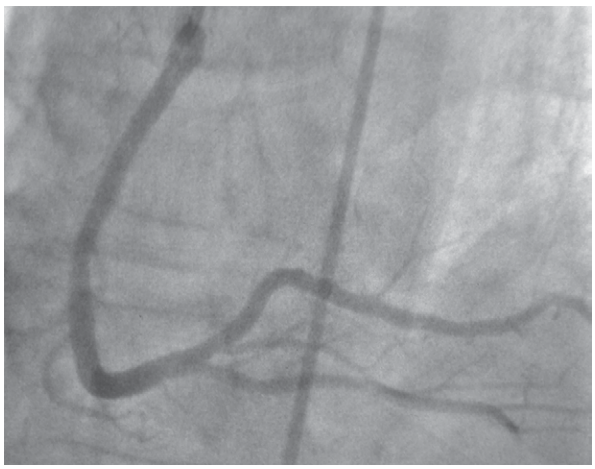

***Fig. 3*** *Coronary angiogram shows restored flow after primary percutaneous coronary intervention of the right coronary artery.*

## Discussion

Interventional cardiologists have few data on which to base clinical decisions regarding the optimal care of STEMI patients on uninterrupted OAC therapy. The 2013 American College of Cardiology/American Heart Association (ACC/AHA) STEMI guidelines recommend that STEMI patients undergo revascularization within 90 minutes of first medical contact[1] in order to improve outcomes[2]; however, all randomized trials establishing primary PCI for STEMI have excluded patients on long-term OAC therapy. Accordingly, there is no consensus on the proper management of such patients. In particular, the choice of access site, adjunctive procedural antithrombotic and antiplatelet therapies, and transition approaches to long-term anticoagulation are not defined.

The ACC Foundation/Society for Cardiovascular Angiography and Interventions expert consensus document on cardiac catheterization laboratory standards[3] does not specifically deal with the treatment of patients on OAC therapy who undergo PCI; however, it does discuss the management of patients on warfarin who undergo diagnostic catheterization. These guidelines recommend that elective coronary angiography for patients on chronic warfarin therapy be deferred until the INR is ≤1.8 for a femoral approach or <2.2 for a radial approach. In patients considered to be at high risk for thromboembolism, bridging therapy with unfractionated or low-molecular-weight heparin might be administered during the periprocedural period until warfarin can be resumed to restore a therapeutic INR.[4] The 2012 ACC/


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AHA guidelines for treating patients with non-STEMI also recommend withholding warfarin until the INR is <2.[5] However, these guidelines do not suggest a specific approach for anticoagulation management during PCI procedures in patients who have a therapeutic INR. The management of patients who are taking the newer OACs for invasive cardiac procedures is not discussed in the current guidelines. Information from the prescribing information recommends that dabigatran be discontinued 24 to 48 hours before invasive procedures, depending on the patient's creatinine clearance.[3] It is recommended that rivaroxaban be discontinued 24 hours before surgical procedures, in order to reduce the risk of bleeding.[6] Apixaban should be discontinued 24 to 48 hours before invasive procedures, on the basis of the perceived bleeding risk of the procedure.[7] Bridging is not generally required when the 3 newer anticoagulants are being taken.

Investigators have conducted a few nonrandomized studies to evaluate the safety of coronary angiography and PCI in patients who are on chronic oral warfarin therapy. Helft and colleagues[8] reported on 50 consecutive patients who underwent PCI via a transradial approach without interruption of OAC therapy. The mean INR was 2.2 ± 0.6. The uses of unfractionated heparin, low-molecular-weight heparin, and glycoprotein (GP) IIb/IIIa inhibitors were low and not randomized. Of the patients, 76% were on dual antiplatelet therapy before the procedure. The investigators noted no excessive bleeding or thrombotic events.

Jessup and associates[9] prospectively evaluated 23 patients having cardiac catheterizations, including 6 patients undergoing PCI; the mean INR was 2.4 ± 0.5. Intravenous heparin was used to maintain an ACT >300 in the PCI group. No GP IIb/IIIa inhibitor was used, and no major or minor bleeding was reported.

Karjalainen and co-authors[10] compared 241 patients (12% STEMI) undergoing PCI on uninterrupted warfarin therapy with 282 patients whose therapy was interrupted. The mean INR in the uninterrupted-therapy group was 2.2 ± 0.5. There was no difference in the use of unfractionated heparin or bivalirudin between the 2 groups; however, GP IIb/IIIa inhibitors and low-molecular-weight heparins were used more frequently in the interrupted-therapy group. The authors reported no excessive bleeding in the uninterrupted-warfarin group. In addition, results of 2 meta-analyses[11,12] showed that elective coronary angiography with or without PCI appeared to be safe in patients with a therapeutic INR (range, 2–3).

As the prevalence of atrial fibrillation increases,[13] it is anticipated that interventional cardiologists will encounter more STEMI patients who are being maintained on warfarin or a novel OAC. For example, an estimated 1.1 million prescriptions for dabigatran were written in the first year after its approval,[14] and the number of patients on such medications is expected to increase.[15] Data are sparse in regard to the safety and efficacy of elective or emergency coronary angiography and PCI in patients who are taking novel OACs. Our patient was on chronic dabigatran therapy for atrial fibrillation at the time of his STEMI. There are no specific periprocedural anticoagulation and antiplatelet recommendations for primary PCI in dabigatran-treated patients.

The use of ACT monitoring during PCI in the presence of OAC therapy is also poorly understood. Chang and associates[16] showed that warfarin and intravenous unfractionated heparin caused a similar, linear increase in ACT; however, the effect of the newer OAC agents on ACT is uncertain. Our patient's ACT during the procedure was 128 s on dabigatran therapy. The duration of dual antiplatelet therapy in patients on OAC agents is also changing. Dewilde and colleagues[17] have suggested that, in patients on chronic warfarin, clopidogrel as platelet monotherapy is as effective as a combination of aspirin and clopidogrel and comparatively reduces bleeding sequelae in stented patients. There are no available data with regard to combining the novel OACs with clopidogrel or the newer antiplatelet medications.

The safety of radial versus femoral access in STEMI patients was evaluated in the trial conducted by Jolly and coworkers.[18] Although the subgroup of STEMI patients benefited from a radial approach, there were no data in this study about patients on OAC therapy. Intuition suggests that bleeding sequelae should be lower with use of a radial approach; however, the operator thought that the radial site was not suitable in our patient. Of note, no bleeding sequela resulted from careful femoral access and the use of a vascular closure device immediately after the procedure.

One controversial issue is the small increase in the number of myocardial infarctions in the dabigatran 150-mg-twice-daily arm versus the warfarin arm in the Randomized Evaluation of Long-Term Anticoagulant Therapy (RE-LY) trial[19] and in a meta-analysis by Uchino and Hernandez.[20] On the basis of these sparse data and the uncertainty of combining dabigatran with potent antiplatelet agents, we chose to switch our patient to warfarin for atrial fibrillation thromboprophylaxis.

We have presented what to our knowledge is the first reported case of emergency coronary angiography and primary PCI in a STEMI patient on chronic dabigatran therapy. As more patients are prescribed OACs, including dabigatran, interventional cardiologists might encounter patients like ours more often. We await clinical registry data that might help to guide the management of primary PCI in patients on OACs.

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