Case Reports

Optical Coherence Tomographic Evaluation

of Hyperacute Bivalirudin-Induced Coronary Stent Thrombosis

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Thrombus formation after stent deployment has been linked to the use of heparin and of antithrombotic agents, such as bivalirudin, during percutaneous coronary intervention. Fluoroscopy has been used to identify stent thrombosis, typically after patients become symptomatic. We describe our use of optical coherence tomography to diagnose and evaluate intraprocedural stent thrombosis in a 68-year-old man who was given bivalirudin just before a percutaneous coronary procedure. This imaging method enabled immediate therapeutic intervention. ***(Tex Heart Inst J 2017;44(4):266-8)***

Key words: *Angioplasty, balloon, coronary/adverse effects; anticoagulants/adverse effects/therapeutic use; coronary thrombosis/diagnostic imaging/prevention & control; percutaneous coronary intervention/adverse effects; stents; time factors; tomography, optical coherence/therapeutic use; treatment outcome*

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The use of bivalirudin during percutaneous coronary intervention (PCI) can cause intraprocedural stent thrombosis.[1] Repeat fluoroscopic examination has been used to identify stent thrombosis, typically after patients become symptomatic. We present a case of hyperacute stent thrombosis that we rapidly diagnosed by using optical coherence tomography (OCT).

Case Report

In March 2015, a 68-year-old man with a history of hypertension, hyperlipidemia, chronic kidney disease, and Crohn's disease presented at our clinic for management of high blood pressure. His medications included amlodipine, benazepril, metoprolol, and clonidine. New 1-mm ST-segment depressions in the anterolateral leads of his electrocardiogram were attributed to a severe hypertensive crisis.

A nuclear perfusion scan revealed a large, moderate-to-severe anteroapical reversible perfusion defect, consistent with a left anterior descending coronary artery (LAD) distribution of ischemia. Coronary angiograms showed significant stenoses in the proximal LAD, mid LAD, and proximal first diagonal branch; stenting was indicated. An OCT confirmed the angiographic findings (Fig. 1).

We had not given the patient antiplatelet or anticoagulant therapy before angiography, so we administered bivalirudin in preparation for intervention. We performed balloon angioplasty of the first diagonal branch, predilated the mid and proximal LAD, and deployed a XIENCE PRIME® LL drug-eluting stent (Abbott Vascular; Santa Clara, Calif) (Fig. 2). Optical coherence tomograms of the LAD showed residual stenosis proximal to that stent, so we deployed an overlapping XIENCE Alpine® drug-eluting stent (Abbott Vascular). Repeat OCTs showed substantial hyperacute intravascular platelet accumulation (platelet-rich or white thrombus) inside the stented segment (Fig. 3). We immediately gave the patient intracoronary and intravenous abciximab, and the incipient thrombosis resolved. The procedure lasted approximately 60 minutes. There were no other sequelae, and he recovered uneventfully.

Discussion

The Academic Research Consortium has categorized stent thrombosis as definite, probable, or possible on the basis of its specificity, and as acute, subacute, late, or very late on the basis of its timing relative to PCI.[2] These categories refer to thrombosis that occurs after a patient has left the cardiac catheterization laboratory. The definitions do not include intraprocedural stent thrombosis,[3] which has been described only in case reports.

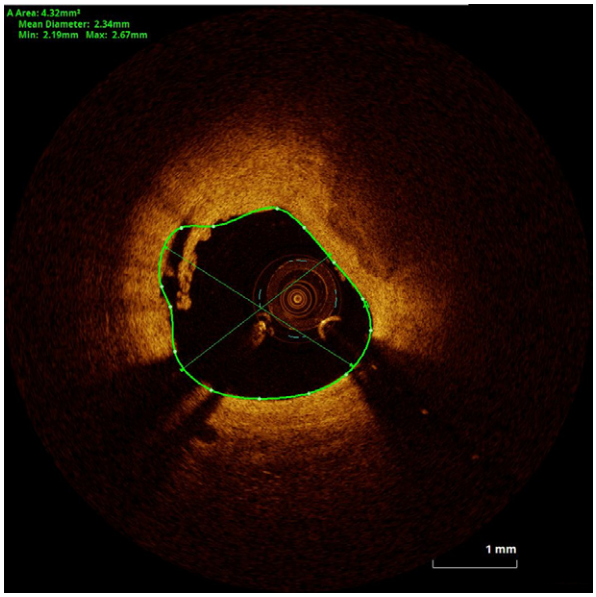

Fig. 1 *Coronary optical coherence tomogram shows atheroma plaque in the proximal left anterior descending coronary artery before stent deployment.*

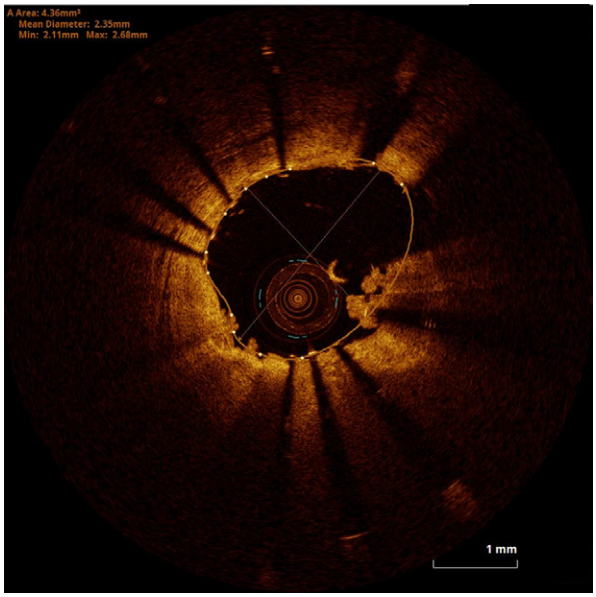

Fig. 2 *Optical coherence tomogram shows good apposition of the stent struts after deployment of the first stent in the left anterior descending coronary artery.*

Several authors have described intraprocedural stent thrombosis associated with bivalirudin use.[1,4,5] Wong and colleagues[6] reported a large thrombus that formed in the venous reservoir during cardiopulmonary bypass in a patient who had been given bivalirudin after an episode of heparin-induced thrombocytopenia. In the Harmonizing Outcomes with Revascularization and Stents in Acute Myocardial Infarction (HORIZONS-AMI) and Acute Catheterization and Urgent Intervention Triage Strategy (ACUITY) trials, patients undergoing primary PCI who were given bivalirudin had higher rates of acute stent thrombosis than did those who were given heparin and a glycoprotein IIb/IIIa inhibitor.[3] Of the 6,591 patients included in those 2 trials, 47 (0.7%) had intraprocedural stent thrombosis, which was associated with ST-segment-elevation myocardial infarction, increased white blood cell count, bivalirudin monotherapy, treatment of thrombotic and bifurcation lesions, and bare-metal stent implantation.[3]

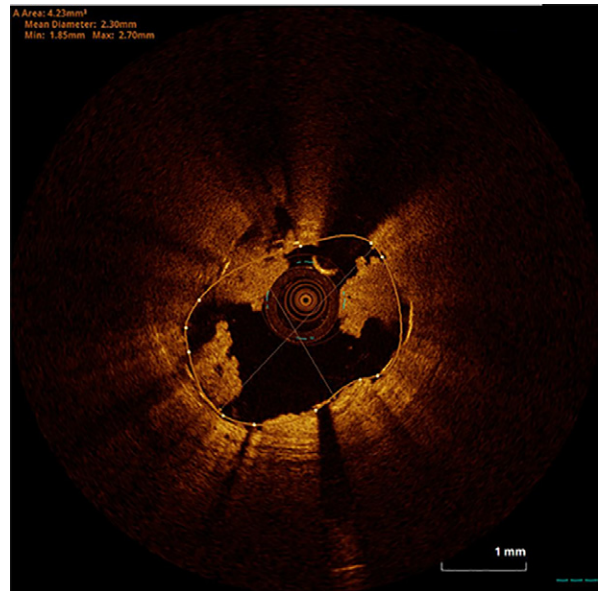

Fig. 3 *Optical coherence tomogram (cross-sectional view) during pullback shows platelet-rich (white) thrombus within the second stent.*

Optical coherence tomography enables views of intracoronary structures (such as arterial walls, stent struts, and thrombus) with micrometric precision.[7] It also enables acute stent thrombosis to be identified in its early stages, as reported by Elmariah and colleagues[8] in a patient with a non-ST-segment-elevation myocardial infarction who was given only bivalirudin before PCI.

Our patient had not been pretreated with clopidogrel, and he was given bivalirudin just before the procedure. The OCT obtained just after stent deployment revealed a substantial formation of platelet-rich thrombus in our asymptomatic patient, and we were able to control it immediately. This experience illustrates the usefulness of OCT in viewing the results of PCI and in identifying intraprocedural stent thrombosis early, before its detection on routine angiograms.

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