Silent Very Late Thrombotic Occlusion of Sirolimus-Eluting Stent Confirmed by Directional Coronary Atherectomy

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Stent thrombosis is defined as thrombotic occlusion of a stent resulting in acute coronary syndrome (ACS). However, all thrombotic occlusions of stents might not result in ACS. The present case report describes silent, very late thrombotic occlusion of a drug-eluting stent that was confirmed from specimens removed by directional coronary atherectomy. (Circ J 2009; 73: 1762–1764)

Key Words: Angioplasty; Coronary artery disease; Restenosis; Stent; Stent thrombosis

Late stent thrombosis after drug-eluting stent (DES) placement has emerged as a major concern.1–4 Stent thrombosis is defined as thrombotic occlusion of a stent resulting in acute coronary syndrome (ACS),5,7 but all thrombotic occlusions of stents might not result in ACS. The present case report describes silent, very late thrombotic occlusion of DES that was confirmed from specimens removed by directional coronary atherectomy (DCA).8,9

Case Report

A 61-year-old man with a history of hypertension was admitted because of exertional angina. Coronary angiography revealed 90% stenosis in the proximal left anterior descending coronary artery (LAD) and collaterals from the right coronary artery (Figure 1A), so the patient was referred for coronary angioplasty. An 18-mm sirolimus-eluting stent (SES, Cypher®, Cordis, Miami, FL, USA), premounted on a 3.5-mm balloon catheter, was deployed at 16 atm. The final angiogram (Figure 1B) and intravascular ultrasound (IVUS) (Figure 2A) showed a good result. He received ticlopidine (100 mg twice daily) plus aspirin (100 mg/day) for 3 months and thereafter was on aspirin monotherapy. Seven months later follow-up angiography demonstrated no in-stent restenosis (Figure 1C). Follow-up IVUS that was performed as part of clinical research demonstrated minimum intimal hyperplasia without incomplete apposition (Figure 2B).

Because of exertional angina persisting for several months, he was referred for coronary angiography 23 months after SES implantation. There were no electrocardiographic abnormalities to indicate ACS (Figure 3) or elevated levels of biomarkers for myocardial necrosis. Coronary angiography demonstrated total occlusion of the SES (Figure 1D) and complete filling of the LAD distal to the SES from the right coronary artery (Figure 1E). The patient was referred for coronary angioplasty. A 0.014-inch Conquest Pro guidewire (Asahi Intecc, Seto, Japan) supported with a tornus catheter (Asahi Intecc) was crossed through the total occlusion. Predilatation using a 2.0-mm Lacrosse balloon catheter (Goodman, Nagoya, Japan) inflated at 6 atm was performed. The guidewire was then changed to a flexi-wire (Guidant, Santa Clara, CA, USA). IVUS was performed and demonstrated a heterogeneous mass in the stent (Figure 2C). With the informed consent of the patient, DCA using a Flexicut directional atherectomy device (Guidant) was performed with the intention of obtaining tissue in the stent to clarify the mechanism of delayed total occlusion (Figure 1F).8,9: informed consent for a case report was obtained later. A total of 7 cuts were performed, inflating the balloon up to 50 psi. A 28-mm SES premounted on a 3.0-mm balloon catheter was then deployed at 18 atm. The final angiogram showed a good result (Figure 1G). Pathological examination of the DCA specimens demonstrated organized thrombus rather than neointima (Figure 4).

Discussion

DES has dramatically reduced the incidence of in-stent restenosis,6,7 but a new problem of late stent thrombosis has appeared.1–4 Previous clinical studies used relatively restrictive and non-uniform definitions of stent thrombosis.6,7 These definitions uniformly regarded evidence of any myocardial infarction with angiographic confirmation of in-stent thrombus or unexplained death within 30 days after the procedure as stent thrombosis, but varied when myocardial infarction was present without angiographic confirmation of target-vessel involvement. Thus, standardized definitions of stent thrombosis were required and were recently proposed by the newly formed Academic Research Consortium (ARC).5 Their definition of definite stent thrombosis requires the presence of ACS with angiographic or autopsy evidence of thrombus or occlusion. Probable
Figure 1. Coronary angiography showing 90% stenosis (arrow) of the proximal left anterior descending coronary artery (LAD) (A). After sirolimus-eluting stent (SES) implantation, angiography demonstrates a good result (B). Seven months later, follow-up angiography shows no in-stent restenosis (C). Coronary angiography demonstrates total occlusion of the SES (D) and complete filling of the LAD distal to the SES from the right coronary artery (E). Arrows (D, E) indicate the proximal and distal edges of the SES. Directional coronary atherectomy is performed (F) and the final angiogram shows a good result (G).

Figure 2. (A) Intravascular ultrasound (IVUS) after sirolimus-eluting stent implantation (stent cross-sectional area 7.6 mm²). (B) Follow-up IVUS (stent cross-sectional area 7.7 mm²). Note minimum intimal hyperplasia without incomplete apposition. (C) IVUS after predilatation for total occlusion (lumen cross-sectional area 2.6 mm² and stent cross-sectional area 7.7 mm²). *Note heterogeneous mass in the stent.

Figure 3. Electrocardiogram at 23 months after sirolimus-eluting stent implantation.
stent thrombosis includes unexplained death within 30 days after the procedure or acute myocardial infarction involving the target-vessel territory without angiographic confirmation. Possible stent thrombosis includes any unexplained death occurring at least 30 days after the procedure. Stent thrombosis was also classified as early (0–30 days), late (31–360 days) and very late (>360 days).

The reported incidence of late and very late stent thrombosis after DES implantation ranges between 0.2% and 0.7%. In the present case, very late thrombotic occlusion of SES occurred in a patient without ACS, which might be considered as delayed in-stent restenosis (late catch-up phenomenon) unless DCA and pathological examination were performed. According to the definitions of stent thrombosis by either previous clinical studies or the ARC, the thrombotic occlusion of SES in the present case is not defined as stent thrombosis because the patient did not present with ACS. Thus, the incidence of thrombotic occlusion of DES may be higher than reported. There were well-developed collaterals in the present case, which might have prevented the patient from presenting with ACS. A previous study showed that, utilizing a sensor-tipped pressure guidewire, one-fifth of individuals without stenotic lesions had immediately recruitable collateral flow to the respective vascular area sufficient to prevent myocardial ischemia during a brief coronary occlusion. In the present case, before SES implantation, collateral vessels from the right coronary artery supplied the distal LAD, so there may have been rapid recruitment of well-developed collaterals. Gradual thrombus formation in SES, not resulting in sudden total occlusion, and recruitment of well-developed collaterals is another possibility for the patient not having presented with ACS. Silent thrombotic occlusion of a stent may occur in patients with no symptoms of myocardial ischemia (ie, some patients with diabetes mellitus or stent implantation in the infarct-related artery), although the present case had exertional angina and did not have diabetes mellitus or a history of previous myocardial infarction.

Conclusions
This case report shows very late thrombotic occlusion of DES in a patient without ACS, which was confirmed by specimens extracted by DCA. The incidence of very late thrombotic occlusion of DES might be higher than reported.

References