# Thrombosis of Sirolimus-Eluting Coronary Stent in the Postanesthesia Care Unit

J. Thomas Murphy, MD, FRCPC, and Brenda G. Fahy, MD

Department of Anesthesiology, University of Kentucky College of Medicine Lexington, Kentucky

A 44-yr-old woman with a drug-eluting coronary stent placement two weeks before surgery suffered a myocardial infarction in the postanesthesia care unit immediately after hysterectomy. She had missed only one dose of aspirin and clopidogrel preoperatively. Early recognition of subacute stent thrombosis and urgent percutaneous coronary intervention probably prevented her death. In this case report, we highlight perioperative coronary stent issues and discuss their implications.

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Coronary artery stenting is a common percutaneous coronary intervention (PCI) that has been associated with perioperative stent thrombosis.(1–6) Thus, the American College of Cardiology (ACC) has recommended that surgery be delayed 2, preferably 4, wk after bare metal stent (BMS) placement.(7) The drug-eluting stent (DES) has been introduced to reduce late stenosis. Because a DES retards re-endothelialization, the risk of early stent thrombosis in the prothrombotic perioperative period may be increased.

## Case Report

A 44- yr-old woman (body mass index, 40) presented with dysfunctional uterine bleeding and ovarian cyst for exploratory laparotomy, abdominal hysterectomy, and bilateral salpingectomy. Surgical indications included potential malignancy, anemia, and severe pelvic pain. She had a history of myocardial infarction (MI) 4 mo previous requiring left anterior descending (LAD) coronary stent implantation.

Two weeks before her surgery she had a 1-day history of angina (without infarction) treated with right coronary artery (RCA) stent implantation. Her angina resolved. At the time of her surgery, her cardiologist recommended proceeding with the surgery and discontinuation of antiplatelet drugs. Cardiac catheterization results (only available postoperatively) revealed an ejection fraction of 50%, left ventricular end-diastolic pressure of 29 mm Hg, patent LAD stent, and an ulcerated 85% RCA stenosis with an aneurysm. A 3.5mm × 23 mm Cypher® (Cordis Corporation, Miami Lakes FL) [sirolimus eluting] DES was implanted in the RCA.

Our patient's history included hypertension, asthma, and hypothyroidism, and cigarette smoking. Medications included levothyroxine 200 μg, simvastatin 40 mg, ASA 325 mg, clopidogrel 75 mg, and atenolol 100 mg, at *hs*.

The day before surgery, the patient was instructed to withhold her evening daily doses of clopidogrel and aspirin, missing one dose of each. Because of extensive adhesions involving the small bowel, omentum, and colon, the procedure was 3.5 h in duration with 200 mL blood loss. Her intraoperative heart rate (HR) was controlled with IV esmolol and labetalol and her trachea was extubated at the conclusion of the surgery.

Her initial vital signs in the postanesthesia care unit were HR 89 bpm, arterial blood pressure 178/90 mm Hg, and $Spo_2$ 98%. Within 20 min, the patient experienced angina with electrocardiogram ST elevation in leads II, III, and aVF. A cardiology consultation resulted in immediate transfer to the invasive cardiology suite. Concurrently, the patient received ASA 325 mg orally, clopidogrel 300 mg orally, and IV infusion of eptifibatide. Coronary angiography revealed RCA thrombosis. PCI included thrombectomy of the RCA stent and implantation of three new BMSs in the RCA. Angiography after PCI showed no residual stenosis. Stenting occurred within 90 min of arrival in the interventional cardiology suite and within 2 h of symptom onset.

Eptifibatide infusion was continued for 12 h. Her serial troponin levels were compatible with myocardial infarction (MI) (Table 1). She was discharged home on the third postoperative day.

## Discussion

We describe immediate postoperative DES (sirolimus) thrombosis and ST elevation MI despite only missing

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Address correspondence and reprint requests to J. Thomas Murphy, MD, Department of Anesthesiology, University of Kentucky College of Medicine 800 Rose Street, Room N-219 Lexington, KY 40536. Address electronic mail to tjmurp2@uky.edu or thomas.murphy@uky.edu.

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**Table 1.** Time Course of Cardiac Biomarkers

| | 0 h (PACU) | 12 h | 18 h | 30 h |
|---|---|---|---|---|
| CKMB (ng/mL) | 1.1 | >100 | >300 | 87 |
| Troponin I (ng/mL) | <0.01 | >300 | 63 | 32 |

CKMB range: 0–8 ng/mL; Troponin I range: 0–0.5 ng/mL.

one preoperative dose (the evening before surgery) of aspirin and clopidogrel. Although a residual antiplatelet effect persisted, DES thrombosis still occurred. This thrombosis developed from the first day after withdrawal of antiplatelet therapy. We propose that prompt diagnosis and treatment of stent thrombosis limited myocardial damage and may have prevented mortality. Contemporaneous ACC perioperative guidelines recommending surgical postponement for 4 to 6 weeks were developed before DESs (7). This was our first noncardiac surgery experience with a DES and revealed the need to change departmental guidelines. A short review of the perioperative risks after PCI with DESs follows.

All PCI and coronary stenting are associated with endothelial injury (8) and risk of early thrombosis. However, because a DES may delay re-endothelialization, the risk of early thrombosis may last longer after implantation. For these reasons patients receiving a DES are placed on long-term (up to 12 months) dual antiplatelet therapy (9,10). The perioperative period is associated with a prothrombotic state and, perhaps, an even greater risk of stent thrombosis. Discontinuation of antiplatelet therapy to reduce bleeding risks may further increase the risk of stent thrombosis. Optimal antiplatelet therapy duration with DESs is unknown and, thus, existing BMS guidelines may be inadequate (4) for the procoagulant perioperative period.

In a retrospective study, 6 of 40 patients undergoing major surgery within 11 days of BMS had a fatal perioperative MI (1). In a retrospective study of 207 patients, there were 6 mortalities with surgery within 6 weeks of stent placement (3). Others have recommended postponement of surgery at least 40, and perhaps 90, days after percutaneous transluminal angioplasty or BMS placement (11,12). Antiplatelet therapy discontinuation within 3 weeks of stenting increases the risk of sudden death (6). In acute coronary syndrome, recent withdrawal of antiplatelet therapy (aspirin and clopidogrel) increased mortality (13). After 335 days of antiplatelet therapy, discontinuation of therapy resulted in 4 cases of DES thrombosis (14); 3 of these were discontinued for noncardiac surgery.

Dual antiplatelet therapy has reduced the incidence of stent thrombosis (15,16). Preoperatively, antiplatelet therapy is frequently discontinued to reduce perioperative bleeding (17). Preoperative aspirin may enhance postoperative bleeding but has not been shown to increase transfusion rates (18,19). However, concerns have been raised with continuation of clopidogrel perioperatively. Clopidogrel has not been shown to increase bleeding in a recent small coronary artery bypass graft surgery (CABG) study (20); in other studies, clopidogrel administration within 4 (21) to 6 (22) days of CABG was an independent risk factor for increased transfusion requirements and prolonged length of stay. Bleeding complications with clopidogrel and aspirin have been reported after elective surgery (23).

Perioperative antiplatelet therapy has obvious implications for regional anesthetic techniques (23). Patient-specific stent selection (e.g., heparin-coated versus BMS versus DES) and avoidance of surgery for at least 3 months after DES has also been recommended (24).

Might heparin administration be a possible alternative to antiplatelet therapy in the perioperative period? In patients with unstable angina or non-Q-wave MI, enoxaparin showed a significant reduction in mortality, MI, and recurrent angina compared with unfractionated heparin (25,26). Enoxaparin administered after angioplasty did not reduce the incidence of restenosis (27). However, during PCI heparin (either unfractionated or low molecular weight) is given, often in combination with other therapies (28). There is at least one DES thrombosis reported preoperatively (29) and another postoperatively (2) when enoxaparin administration replaced antiplatelet therapy.

This case resulted in changes in departmental policy. The minimum delay for elective noncardiac surgery in a DES patient has been increased to a minimum of 3 months for the sirolimus DES and 6 months for the paclitaxel DES in keeping with ACC guidelines for PCI after ST elevation MI (30). Most importantly, antiplatelet therapy is maintained if possible during the perioperative period in consultation with cardiology, the surgeon, and the anesthesia care team because major vascular events are reduced with prolonged antiplatelet therapy (31).

Cardiologists and referring surgeons at our institution have been informed of these issues and our concerns to allow individualized evaluations of the relative risk/benefit of preoperative coronary stenting for elective noncardiac surgeries. Urgent surgical patients (e.g., malignancy) are managed individually in consultation with the cardiology service. Since this case was prepared for submission, new recommendations have begun to appear in the literature regarding stent selection and timing of noncardiac surgery (24). Further studies are needed, and we hope that updated ACC PCI guidelines will be available soon.

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