An Unusual Cluster of Complications Following Drug-Eluted Stenting: Stent Fracture, Peri-Stent Aneurysm and Late Thrombosis

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Drug-eluting stents were designed to reduce neointimal hyperplasia and thus diminish the likelihood of coronary restenosis. However, they may carry some long-term risks. We report here an unusual case of late multiple drug-eluting stent-related complications occurring in the same patient, namely, stent fracture, peri-stent aneurysm formation and late stent thrombosis-causing recurrent adverse myocardial infarction events.

Patient Description

A 59 year old man was noted to have an abnormal stress test. He underwent coronary angiography on 8 July 2004, showing proximal and mid-left anterior descending artery lesions and proximal right coronary artery stenosis post-mildly ecstatic segment. Multi-vessel angioplasty was undertaken using three Cypher stents (Cordis, Johnson and Johnson, NJ, USA) deployed in the proximal LAD (3 x 13 mm), mid-LAD (2.5 x 33 mm), and proximal RCA (3 x 18 mm). Clopidogrel treatment was given for 1 year. Twenty months later, the patient presented due to anterior wall ST elevation myocardial infarction and was taken to the catheterization laboratory with presumed diagnosis of late stent thrombosis of the LAD. Angiography revealed the proximal stent to be patent while the mid-LAD stent was occluded [Figure 1A]. An attempt to cross the occlusion site using a floppy guidewire was unsuccessful due to a stent fracture that caused misalignment of the proximal and distal segments of the broken stent [Figure 1B]. The RCA stent was patent with peri-stent aneurysm dilatation in the proximal edge [Figure 2]. The patient was then referred for emergency coronary bypass grafting surgery, which included left internal mammary artery implantation to the distal LAD and a single saphenous vein graft into a marginal branch. The post-surgical course was uneventful for 5 days of hospitalization.

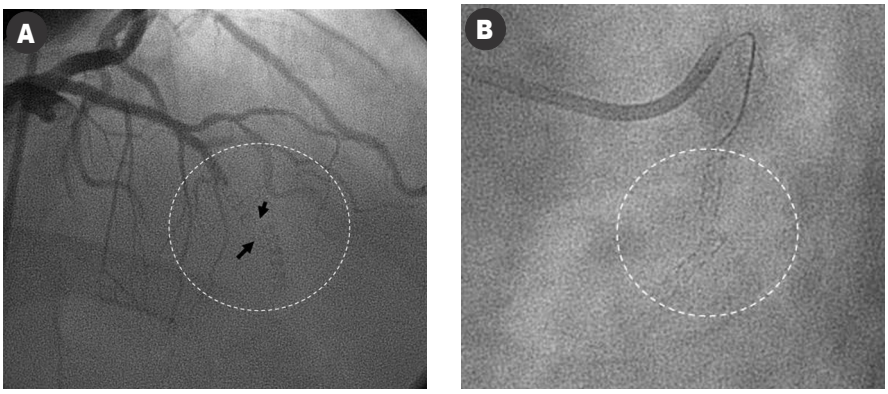

Figure 1. [A] Mid-LAD Cypher stent fracture. **[B]** Failure to cross with a wire.

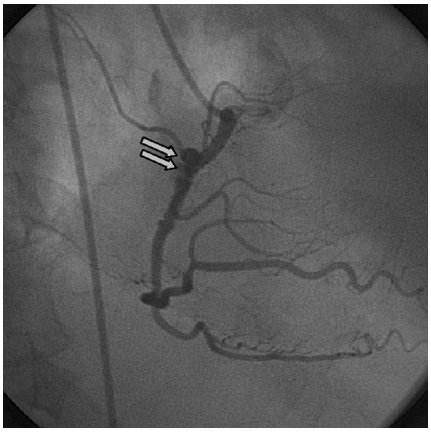

Figure 2. Mid-RCA: peri-stent sneurysm.

One week later, the patient underwent echocardiography, which revealed mild to moderate ventricular dysfunction and small apical thrombus. He was rehospitalized to initiate anticoagulation and was treated with a single oral dose of heparin and coumadin. One day later, the patient complained of severe rest angina and electrocardiogram showed inferior wall STEMI. He was immediately referred to the catheterization laboratory and thrombotic

LAD = left anterior descending artery
RCA = right coronary artery

STEMI = ST elevation myocardial infarction

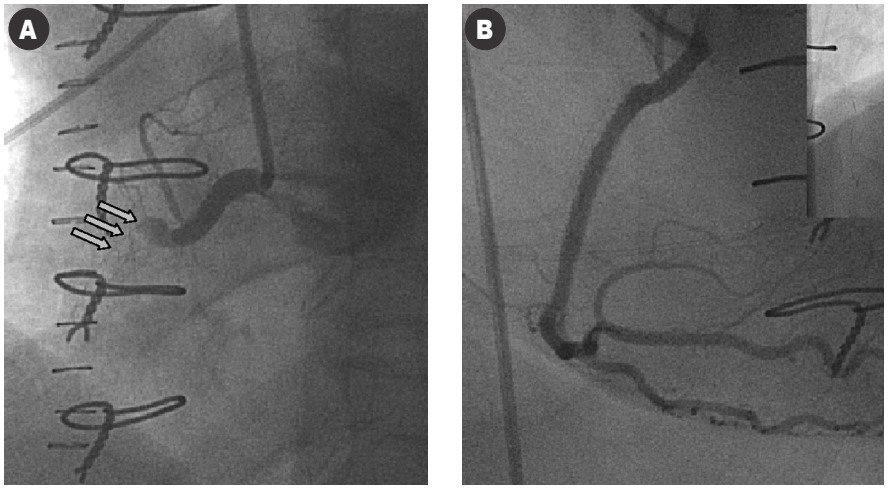

Figure 3. [A] Occluded RCA due to stent thrombosis. **[B]** Urgent percutaneous coronary intervention of RCA.

in-stent occlusion of the RCA was demonstrated [Figure 3A]. Coronary angioplasty was conducted with balloon dilatation and deployment of two bare metal stents to cover the obstructed site [Figure 3B]. The patient received orally clopidogrel in addition to aspirin and coumadin medication, maintaining an international normalized ratio of 2–2.5. He was discharged 5 days later, with left ventricular function studies showing moderate dysfunction, apical aneurysm and mild inferior hypokinesis with an ejection fraction of 42%.

At 6 months follow-up the patient was doing well and had no signs of angina or congestive heart failure. His antithrombotic pharmacotherapy included aspirin, clopidogrel and coumadin medication, which was discontinued at his 6 month visit.

Comment

We report here a cluster of threats appearing relatively late after the use of Cypher stents in the same patient: namely, stent fracture, peri-stent aneurysm formation and late stent thromosis, together causing consecutive STEMI events. The presentation of acute myocardial infarction due to stent fracture is probably rare [1]. Stent fracture could be partial or complete, involving either strut fracture or complete breakage of the stent. The latter event may cause immediate flow obstruction, thrombosis and myocardial infarction. Fracture of a stent is probably related to mechanical fatigue of the metallic stent strut, or it may result from a manufacturing defect. The likelihood of stent fracture in the coronary circulation is unknown. A recent report showed that stent fracture occurred in 10 of 530 treated patients (1.8%) using drug-eluting stents who underwent repeat angiogram [2]. It may be aggravated by implantation of a stent within highly pulsating structures (myocardial "bridge"), the use of long stents, or drug-eluted stents unsupported by neointima tissue.

The second issue that was highlighted in our patient was the occurrence of late peri-stent aneurysm formation following implantation of a drug-eluting stent. The mechanism of such a phenomenon and the pathophysiology implications are not fully known. The explanation might be hypersensitivity reaction to the drug and/or polymer causing adventitial inflammation, weakening of the media, excessive dilatation and, consequently, marked mal-apposition [3]. The third complication was late postoperative stent thrombosis. There are increasing numbers of reports of late stent thrombosis after use of drug-eluting stents [4]. The total stent thrombosis rate varies and may occur in 0.8–2.5% during long-term follow-up, with very late events (i.e., beyond 6 months) occurring in about 0.4–0.8% of patients [5]. Our patient had recent bypass surgery. We presume that the postoperative hypercoagulable state with delayed endothelization in the vicinity of coronary aneurysm could have provoked the thrombotic event in our patient.

In summary, the three main questions presented here encapsulate the "dark side" of drug-eluting stent implantation. In reality and practice, we do not have a clear definition of the prevalence and predictors of *in vivo* stent breakage, stent aneurysm or late stent thrombosis, or a precise idea of the optimal duration of dual antiplatelet pharmacotherapy needed following stent implantation.

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Kindness is in our power, even when fondness is not

Samuel Johnson (1709-1784), British poet, critic and lexicographer