Multivessel Coronary Artery Disease Treated with Drug-Eluting Stents

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In this report we describe the case of a patient with critical stenoses at the origin of the left anterior descending and left circumflex arteries and diffuse disease of the mid left anterior descending and right coronary artery, treated with implantation of drug-eluting stents.

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Treatment of multiple lesions in multivessel coronary artery disease has been attempted by interventional cardiologists in the angioplasty era[1-4] and more aggressively with the introduction of stents.[5] Treatment with percutaneous coronary intervention (PCI) is equivalent to coronary artery bypass surgery in terms of death and acute myocardial infarction, but results in significantly more events in terms of revascularization rates. This area is rapidly evolving since the advent of drug-eluting stent technology that promises to overcome restenosis.[6-8]

Case presentation

A 67-year-old male with hypertension and without a previous history of cardiac disease started complaining of effort angina, CCS class III, in November 2003. He had undergone coronary angiography the same month, revealing critical (90%) stenosis at the ostium of the left anterior descending (LAD) and left circumflex (LCX) coronary arteries, diffuse disease with significant stenoses in the mid and distal LAD and diffuse disease of the right coronary artery (RCA) with stenoses in the mid and distal segments (Figure 1). The systolic function of the left ventricle was normal, with an ejection fraction of 60%. Although the initial recommendation was bypass surgery, the patient preferred to undergo PCI, which took place at the beginning of December 2003.

The patient was already on aspirin 100 mg o.d. and was started on clopidogrel 75 mg o.d. four days pre-procedure. Enoxaparin 1 mg/kg was administered intravenously at the beginning of the procedure. Both LAD and LCX were wired using a Hi-Torque Balance Middleweight guide wire (Guidant Corp.) and a 3.0/23 mm Cypher stent (Cordis Corp.) was implanted at 18 atm in the mid LAD up to the origin of the first diagonal branch. A 2.5/20 mm Crossail balloon (Guidant Corp.) was used (12 atm) to treat the distal LAD with an acceptable result (Figure 1). A 3.5/12 mm Taxus stent (Boston Sc. Corp.) was implanted (20 atm) at the ostium of the LAD and a 3.0/23 mm Taxus stent (22 atm) at the ostium of the LCX artery with optimal angiographic result (Figure 1).

The same guide wires were used for access to both the posterior descending

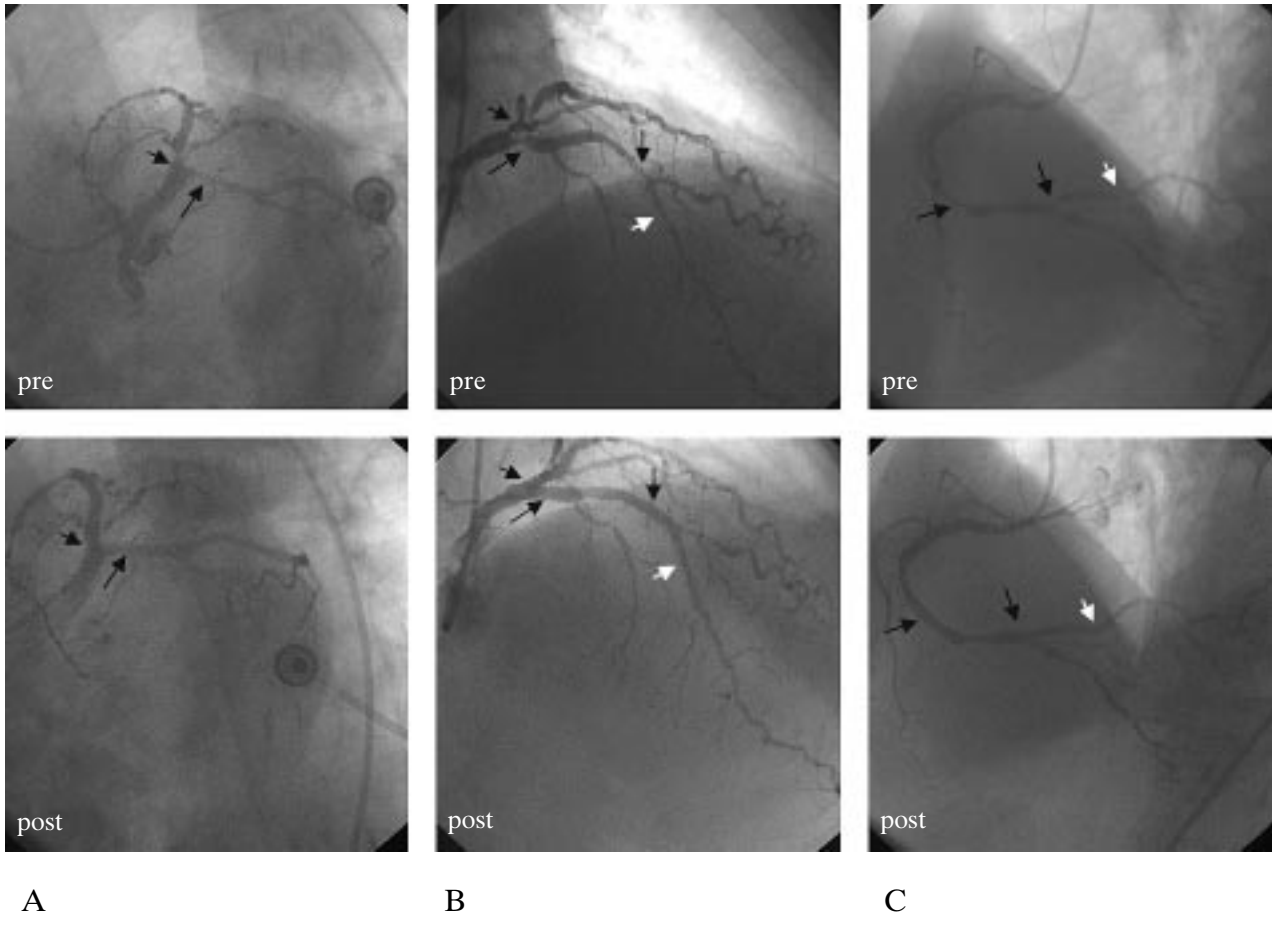

Figure 1. Left (A, B) and right (C) coronary arteries pre (upper row) and post-procedure (lower row). (A: 20RAO 40CAU, B: 10RAO 40CRA, C: 40LAO 20CRA, the arrows indicate the lesions treated).

artery and the posterolateral branch of the RCA. Predilatation was performed using a 2.5/15 mm Maverick balloon (Boston Sc. Corp.) for both branches, at 8 atm for the distal RCA, towards the posterolateral branch, and at 6 atm towards the ostium of the posterior descending artery. A 3.0/18 mm Cypher stent was implanted in the distal RCA towards the posterolateral branch (20 atm), covering the total segment treated by the 15mm long balloon, and a 3.5/18 mm Cypher stent was implanted in the mid RCA (20 atm). For the distal posterolateral branch plain angioplasty using the same 2.5/15 mm Maverick balloon at 12 atm resulted in an acceptable outcome (Figure 1). There were no complications during revascularization. The total fluoroscopy time was 42 minutes.

The patient was discharged the next day on combined antiplatelet treatment with aspirin 100 mg o.d. and clopidogrel 75 mg o.d. Clopidogrel had to be replaced by ticlopidine 250 mg b.d. 3 days post-procedure, due to an allergic skin reaction.

The patient was relieved from effort angina post-procedure and both β-blocker therapy and nitrate therapy were stopped. A stress-echo was performed at the beginning of May 2004 (5 months post-procedure). The patient completed the full protocol with infusion of dobutamine and atropine, at a maximum of 171 beats/minute, BP: 170/90 mmHg, without angina, ECG changes or evidence of ischemia from the echocardiographic images.

Discussion

The use of PCI to treat patients with multivessel coronary artery disease has been compared to coronary artery bypass surgery in multicenter randomized clinical studies.[1-5] There were no significant differences between the two approaches as regards "hard end-points" (death, myocardial infarction, stroke), at least for non-diabetic patients.[9] Nevertheless, patients treated with PCI had significantly higher rates of rehospitalization and need for a new revascularization procedure. The rate of need for revascularization one year post-stenting was 16.8% in the ARTS study, while the revascularization rate at the same time period post bypass surgery was only 3.5%.[5] Based on these results, non-diabetic patients with normal ventricular function have been offered the option of non-surgical treatment after being informed of the "tax" they would have to pay, meaning the relatively high possibility of restenosis often leading to a new revascularization procedure.

The magnitude of the "tax" has been questioned with the advent of drug-eluting stents. The in-lesion restenosis rates in the first published clinical trials range from 0-5%,[6-8] with results lasting for at least two years post-procedure.[10] The relative restenosis occurrence and need for revascularization after drug-eluting stent implantation for multivessel coronary artery disease is the issue in the ARTS II multicenter study, currently at the stage of clinical follow-up.[11]

Problems regarding availability of stent sizes (currently up to 3.5 mm diameter), inability of access to tortuous distal coronary artery segments and, above all, the matter of high cost will of course have to be overcome before drug-eluting stents become deployed for all coronary lesions in everyday clinical practice. One might also argue that severe lesions at the origin of the LAD or LCX are not usually included in clinical trials. On the other hand, cases like the one described are often treated in centers with a tradition of complex coronary artery lesions, such as the Centro Cuore Columbus and San Raffaele Hospital in Milan. The follow-up of patients with multivessel disease treated with Cypher stents in these centers has been reported[12] and demonstrates the safety of this approach. What is interesting is the revascularization rate at six months, which was 7.3%. Although both the case selection and the mode of follow-up are different to the ARTS study, these numbers are close to the 3.5% revascularization rate reported post-bypass surgery.

If the less complex stenoses treated in the multicenter ARTS II study will result in even lower rates of revascularization post-stenting, PCI will become much more attractive than bypass to an ever growing number of patients. While awaiting the results, it is reasonable for interventional cardiologists to develop their techniques in order to meet the increased needs of a new era.

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