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Percutaneous revascularization in patients with previous coronary artery bypass graft surgery. Immediate and 1-year clinical outcomes

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Abstract

Background: An increasing number of patients undergoing percutaneous interventions (PI) have experienced previous coronary artery bypass graft surgery (CABG). However, the impact of PI on outcomes in such patients is currently unclear. We evaluated the immediate and 1-year clinical outcomes of post-CABG patients who underwent PI in a tertiary center.
Methods: From January-2005 to September-2006, 91 consecutive post-CABG patients underwent 197 stent implantations (84% drug-eluting stents) for 154 lesions. 58% were treated in the native coronary arteries, 34% in the grafts and 8% in both type of vessels. Major adverse cardiac events (MACE) were recorded in-hospital and at 1-year follow-up.
Results: Procedural success rate was 95.6%. In-hospital MACE rate was 3.3%. At 1 year, the incidence of MACE was 18.6%: death occurred in 5.4% of the patients, myocardial infarction in 2.2%, and 10.9% of the patients underwent repeat revascularization (target lesion revascularization was required in 5.4%). Multivariate analysis revealed left ventricular ejection fraction <50% (OR 4.6, 95% CI 1.8 to 7.5, $p=0.01$) and multivessel intervention (OR 2.7, 95% CI 1.2 to 4.5, $p=0.03$) to be independent predictors of MACE at 1 year.
Conclusions: Immediate results showed the safety and efficacy of percutaneous revascularization in post-CABG patients. The relatively low risk need for target lesion revascularization obtained is encouraging. Independent predictors of MACE at 1 year were left ventricular disfunction and multivessel intervention.

Keywords: Percutaneous intervention; Bypass surgery; Outcome

1. Introduction

Patients with previous CABG may require repeat revascularization procedures due to progression of atherosclerotic disease in the native coronary arteries and/or the bypass grafts [1,2]. Repeat grafting is complicated by increased morbidity and mortality and has a worse clinical outcome than a first bypass operation [3,4]. In addition, reoperation is less likely to be recommended if the area of myocardium at risk is not large or if the availability of graft conduits is limited. Therefore, the number of patients with prior CABG who are referred for percutaneous revascularization has been steadily increasing [5].

To date, few reports have evaluated the clinical impact of PI in post-CABG patients. Previous studies have shown that in these patients PI offers lower procedural morbidity and mortality risks than redo-CABG, although it is associated with a greater need for subsequent revascularization procedures [6,7]. Likewise, these patients have higher rates for death, myocardial infarction and repeat revascularization after PI compared to patients with no prior revascularization procedures [8–10]. However, these studies did not include drug-eluting stents (DES) and other innovations that have changed percutaneous

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revascularization technique. Therefore, the impact of PI on outcomes in this complex population is currently unclear.

The purpose of this study was to determine the immediate and 1-year clinical outcomes in a cohort of consecutive patients with previous history of CABG undergoing percutaneous revascularization in a tertiary center.

2. Methods

2.1. Study patients

From January 2005 to September 2006, a total of 91 consecutive patients (154 lesions) with previous history of CABG have undergone PI at our institution. All patients had a clinical indication for repeat revascularization. Selection of cases for PI, instead of redo-CABG, was left to the discretion of interventional cardiologists and clinicians. Patients included in this study were those considered of very high surgical risk for reoperation, related to comorbidities or emergency situations, and/or those with coronary anatomy favourable to percutaneous procedures. In the present study, patients were excluded if there was a contraindication to antiplatelet agents. The choice of revascularization on the grafts or the native coronary arteries was left to the discretion of the operator.

Baseline clinical and angiographic characteristics, procedural results, and hospital complications were entered prospectively into a computerised database. All patients were treated and studied after giving informed consent.

2.2. Stenting procedure and antiplatelet regimen

Interventions were performed according to current standards, with the interventional strategy (including pre- or postdilatation, choice of stent, periprocedural glycoprotein IIb/IIIa inhibitors usage) left to the operator's discretion. Unfractioned heparin (70–100 U/kg) was administered before guide-wire insertion. All patients were pretreated with clopidogrel and aspirin. A loading dose of 300 mg of clopidogrel was administered if patients were not pretreated. After the procedure, aspirin (100 mg/day) continued indefinitely. Clopidogrel (75 mg/day) was prescribed for $\geq$1 or 6 months after bare-metal (BMS) or DES implantation, respectively. Cardiac enzymes and 12-lead electrocardiogram were determined routinely after interventions, at 8-h intervals during the first 24 h.

2.3. Angiographic analysis

Standard qualitative and quantitative analyses and definitions were used for angiographic analysis [11]. Using the guiding-catheter for magnification calibration and an online quantitative coronary angiographic analysis system (Inturis Cardio Image, Philips Medical Systems), minimal luminal diameter, percent diameter stenosis, and reference vessel diameter were measured before and after the intervention from a single matched view showing the smallest minimal luminal diameter.

2.4. Definitions and follow-up

Procedural success was defined as a Thrombolysis In Myocardial Infarction grade 3 flow and <20% residual stenosis without major procedural or in-hospital complications (including death, myocardial infarction, and need for emergency surgery). Myocardial infarction was defined by a rise in creatine kinase-MB fraction of more than 3 times the upper limit of normal [12].

Each patient was followed for 1 year after the index procedure. Follow-up information was obtained by office visits or telephone interviews, and by review of hospital charts. Documentation for events that occurred at other institutions was also obtained. Angiographic follow-up and repeat revascularization was only performed if clinically indicated by symptoms or documentation of myocardial ischemia. A MACE was defined as the occurrence of death, myocardial infarction or need for a new revascularization procedure. Death was defined as mortality from any cause. Angiographic restenosis was defined by diameter stenosis of <50% in the segment inside the stent or 5 mm proximal or distal to it at angiographic follow-up. The indications for a new revascularization procedure were either the occurrence of a new significant coronary artery stenosis not present on the initial angiogram or restenosis at the site of previous dilatation. Stent thrombosis was defined as angiographic documentation of thrombotic stent occlusion associated with a clinical event, an unexplained sudden cardiac death, or myocardial infarction not clearly attributable to another coronary lesion [13]. Complete revascularization was defined as successful treatment of the index vessel with no residual stenosis <70% in any other

Table 1
Clinical characteristics (n=91 patients).

Age [years±SD]	70.5±7.6
Men [*n* (%)]	80 (87.9)
Hypertension [*n* (%)]	55 (60.4)
Diabetes mellitus [*n* (%)]	31 (34.1)
Hypercholesterolemia [*n* (%)]	45 (49.5)
Smoker [*n* (%)]	28 (30.8)
Previous myocardial infarction [*n* (%)]	17 (18.7)
Previous percutaneous intervention [*n* (%)]	21 (23.1)
Clinical presentation [*n* (%)]	
Stable angina	41 (45.1)
Unstable angina	32 (35.2)
Myocardial infarction within 2 weeks	8 (8.8)
Silent ischemia	9 (9.9)
Heart failure	1 (1.1)
Left ventricular ejection fraction <50% [*n* (%)]	18 (19.8)
Multivessel coronary disease [*n* (%)]	86 (94.5)
Time from bypass surgery [years±SD]	8.5±5.5