SCIENTIFIC LETTER

Percutaneous coronary intervention in HIV infected patients: immediate results and long term prognosis

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Heart 2006;92:543–544. doi: 10.1136/hrt.2005.068445

The advent of new antiretroviral agents in 1996 dramatically reduced human immunodeficiency virus (HIV)-associated morbidity and mortality. Prevention and treatment of cardiovascular complications in HIV infected (HIV+) patients are a new and emerging challenge for physicians caring for these patients because of the prolongation of survival and long term complications of highly active antiretroviral treatment. Few data are available regarding the results of conventional treatment—that is, coronary revascularisation and management of the cardiovascular risk factors in HIV+ patients.^{1–2} In acute coronary syndromes, previous studies reported a high rate of major adverse cardiac events (MACE) and target vessel revascularisation (TVR) in HIV+ patients.^{3–4}

The objective of this study was to compare the immediate results and long term prognosis after percutaneous coronary intervention (PCI) in HIV+ and non-HIV infected (HIV–) patients.

METHODS

We conducted an observational study and clinical outcome analysis of 50 consecutive HIV+ patients undergoing PCI (January 2001 to December 2003). All patients underwent PCI during the same admission for ST segment elevation myocardial infarction (MI), non-ST segment elevation MI, unstable angina, and stable angina pectoris. Patients with cardiogenic shock at the time of admission were excluded. A control group of 50 consecutive HIV– patients who underwent PCI, matched for age and sex, were enrolled during the same period. The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the local ethics committee.

Baseline demographic data, cardiovascular risk factors, indications for PCI, angiographic results, in-hospital clinical events, and 20 month clinical outcome were recorded. The end point of the study was to assess the rate of MACE, defined as the combined rate of death from a cardiac cause, non-fatal MI, and TVR in HIV+ and HIV– patients during a 20 month clinical follow up. Any TVR was defined as either percutaneous revascularisation or bypass surgery to a vessel that had been treated during the initial procedure. The first event for each patient was recorded for the composite end point. Data were analysed with SPSS 11.0 software (SPSS Inc, Chicago, Illinois, USA). Cox proportional hazards models were used to compute hazard ratios (HRs) of MACE. Cumulative survival without MACE was evaluated by Kaplan-Meier analysis and the related curves were compared by the log rank test.

RESULTS

Cardiovascular risk factors were well balanced in the two groups except for a higher rate of hypertriglyceridaemia (78% v 46%, $p = 0.001$) and lower concentration of high density lipoprotein cholesterol (88% v 42%, $p < 0.001$) in HIV+

Table 1 Baseline angiographic procedural characteristics and medications

	HIV+ (n=50)	HIV– (n=50)	p Value
Age (years)	43.3 (6.5)	44.0 (3.2)	0.46
Men	45 (90%)	44 (88%)	0.75
STEMI	12 (24%)	24 (48%)	0.01
NSTEMI	37 (74%)	20 (40%)	<0.001
Stable angina	1 (2%)	6 (12%)	0.11*
LVEF (%)	53 (9)	55 (8)	0.57
Number of diseased vessels	1.74 (0.75)	1.62 (0.72)	0.42
≥2	30 (60%)	24 (48%)	0.23
ACC/AHA type B2/C lesions	14 (28%)	25 (50%)	0.02
Number of lesions dilated	1.38 (0.49)	1.24 (0.43)	0.13
Stented patients	76%	96%	0.004
Mean stents/lesion	1.21	1.27	0.57
Stent diameter (mm)	3.3 (0.33)	3.2 (0.39)	0.47
Stent length (mm)	15.3 (5.6)	13.8 (3.7)	0.15
Medication at discharge			
Aspirin + clopidogrel	50 (100%)	46 (98%)	0.49*
β Blockers	30 (60%)	46 (98%)	<0.001
ACE inhibitors	14 (28%)	17 (36%)	0.39
Statins	31 (62%)	39 (83%)	0.02
Fibrates	1 (2%)	0	1.000*

Data are presented as the mean (SD) or number (%) of patients.

*Fisher's exact test.

ACC, American College of Cardiology; ACE, angiotensin converting enzyme; AHA, American Heart Association; LVEF, left ventricular ejection fraction; MI, myocardial infarction; NSTEMI, non-ST segment elevation myocardial infarction; PCI, percutaneous coronary intervention; STEMI, ST segment elevation myocardial infarction.

patients than in HIV– patients. However, more HIV– patients had obesity, family history of premature coronary artery disease, and diabetes mellitus. The mean (SD) duration of HIV infection was 8.0 (4.8) years. Forty eight HIV+ patients (96%) were given highly active antiretroviral treatment at the time of PCI and 38 (76%) were taking protease inhibitors with a median exposure of 24 months (range 1–60). The median current CD4 cell count was 456 cells/mm³ (range 18–1220) and the median viral load was 50 copies/ml (range 20–500 000). Table 1 presents angiographic and procedural characteristics and indications for PCI. A procedural success rate of 98% was achieved in the two groups. Only one coated stent was implanted in each group. The use of glycoprotein IIb/IIIa inhibitor was low (2 v 3 patients). In-hospital course was uneventful in both groups including no acute stent thrombosis. No patients were lost during a mean (SD) follow up of 625 (321) days. No deaths were recorded during the follow up period. Clinical restenosis including TVR was not significantly different between HIV+ and HIV– patients (14% v 16%, $p = 0.78$) at follow up.

Abbreviations: CI, confidence interval; HR, hazard ratio; MACE, major adverse cardiac events; MI, myocardial infarction; PCI, percutaneous coronary intervention; TVR, target vessel revascularisation

Figure 1 Kaplan-Meier major adverse cardiac event-free survival curve according to HIV status.

Rates of MACE-free survival and occurrence of MI at 20 months were similar in HIV+ and HIV- patients (80% *v* 84%, $p = 0.64$ and 8% *v* 0%, $p = 0.12$, respectively). One HIV+ patient had a second MI and TVR in the same initial territory. The type of antiretroviral drug used had no impact on MACE and TVR irrespective of whether the HIV+ patients were taking protease inhibitors (8 (21%) *v* 2 (17%), $p = 0.84$ and 6 (16%) *v* 1 (8%), $p = 0.50$, respectively). The use of protease inhibitors was not predictive of any cardiovascular events (MACE, MI, or TVR). The Kaplan-Meier curve illustrated in fig 1 shows that there was no difference in MACE between HIV+ and HIV- patients over the entire follow up. In the entire study population, the only independent predictors of MACE at the end of follow up were sex (female, HR 5.25, 95% confidence interval (CI) 1.59 to 17.28, $p = 0.006$), non-ST segment elevation MI (HR 8.59, 95% CI 2.25 to 32.81, $p = 0.002$), and American College of Cardiology/American Heart Association type B2/C lesions (HR 5.44, 95% CI 1.97 to 15.01, $p = 0.001$).

DISCUSSION

Our study points out that PCI is similarly successful in HIV+ and HIV- patients with stable or unstable coronary artery disease. Many factors can increase the rate of cardiovascular events and preclude the results of PCI in HIV+ patients: (1) insulin resistance, diabetes mellitus, and the lipodystrophy syndrome; (2) resistant dyslipidaemia (lower concentration of high density lipoprotein cholesterol and higher concentrations of triglycerides and small and dense low density lipoprotein particles) with lower effectiveness of lipid lowering treatment; (3) chronic inflammation and infection with increased concentration of cytokines; (4) enhanced endothelial injury secondary to dyslipidaemia, oxidant stress, adhesion molecules, HIV Tat protein, and related angiogenic effects; and (5) a prothrombotic state linked to HIV status or antiretroviral treatment. HIV+ patients and the general population may derive different benefits from coronary

revascularisation because of the pathophysiological mechanisms of coronary artery disease.

Matetzky *et al*³ reported in a cohort of 17 dilated HIV+ patients a TVR rate of 43% as compared with 11% in HIV- patients after 15 months follow up. Escout *et al*⁵ also reported a relatively high rate of TVR, having observed a TVR rate of 35% at 36 months in a group of 17 HIV+ patients. In our study, the high use of stenting can explain the low rate of TVR (less than 15%) at follow up. The potential benefit of stenting is also suggested in a case-control study of 68 HIV+ patients with acute coronary syndromes (29 of 68 had PCI), in which the rate of TVR observed at follow up did not differ significantly between the subgroup of stented HIV+ patients and HIV- patients.⁴ The benefit of drug eluting stents in this population remains to be examined. Our study was not designed to evaluate angiographic restenosis but rather the rate of MACE and clinical restenosis after PCI in a long term clinical follow up.

PCI is an adequate and safe treatment strategy of coronary revascularisation in HIV+ patients without significant differences in terms of clinical restenosis and MACE from the control population. Large prospective studies on prognosis of coronary revascularisation including drug eluting stents in HIV+ patients are warranted.

ACKNOWLEDGEMENTS

The authors are grateful for the editorial assistance of John Cochran in the preparation and review of this manuscript.

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Accepted 2 September 2005

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