

SCIENTIFIC LETTER

Primary percutaneous coronary intervention for patients with acute ST elevation myocardial infarction with and without diabetes mellitus

R J van der Schaaf, J P S Henriques, J J Wiersma, K T Koch, J Baan Jr, K J J Mulder, J D Durrer, J G P Tijssen, J J Piek, R J de Winter

Heart 2006;92:117–118. doi: 10.1136/hrt.2004.059675

Patients with acute ST segment elevation myocardial infarction (STEMI) with diabetes mellitus (DM) have an increased mortality and morbidity when compared with patients without DM.¹ Information is limited about clinical outcome of with STEMI and DM treated with reperfusion. Furthermore, patients with DM have a higher rate of thrombolysis failure.^{2,3} Information is also limited on long term outcome of patients with DM treated with primary percutaneous coronary intervention (PCI),⁴ which is the reperfusion treatment of choice.⁵

We therefore studied one year mortality among patients with and without DM in a large cohort of patients with acute STEMI treated with primary PCI. Furthermore, we studied the impact of preadmission treatment for DM, either oral medication or with insulin.

METHODS

Between January 1997 and December 2002, 1463 consecutive and unselected patients were admitted to our hospital with acute STEMI. Of the 1463 patients, 17 were lost to follow up and for another 138 patients data about DM status was not available. The remaining 1308 patients constituted the study cohort. Follow up information was obtained one year after the initial event by written questionnaire sent to all patients. If necessary outpatients' reports were reviewed and general practitioners were contacted by telephone. Baseline clinical and angiographic data were collected prospectively on a dedicated database. The patients were categorised as being without DM or as having an established diagnosis of DM at admission. Patients with DM were categorised according to preadmission treatment: either with oral medication or diet controlled DM (non-insulin dependent DM (NIDDM)) or with insulin (insulin dependent DM (IDDM)). IDDM comprised both type 1 and type 2 DM. Patients treated with insulin in combination with oral medication were categorised as having IDDM.

To find independent predictors of one year mortality we performed multivariate analysis with a Cox proportional hazards regression model.

RESULTS

Of the 1308 patients, 174 (13.3%) had a confirmed diagnosis of DM at admission. Patients with DM were older (< 60 years; 44.4% v 64.4%, $p < 0.001$) and fewer of them were men (64.9% v 74.9%, $p = 0.006$) or smokers (34.5% v 55.2%, $p < 0.001$). More of the patients with DM were hypertensive (49.4% v 31.7%, $p < 0.001$), had a previous coronary event (previous PCI, STEMI, or coronary bypass grafting: 40.8% v 20.3%, $p < 0.001$), or had a long ischaemic time (> 3 hours) (54.7% v 44.3%, $p = 0.027$) compared with patients without DM. Patients with DM had a higher incidence of cardiogenic shock at admission (13.2% v 8.3%, $p = 0.034$) and more of

them needed intra-aortic balloon counter pulsation (12.1% v 5.6%, $p < 0.001$). Patients with DM had more multivessel disease (55.7% v 37.9%, $p < 0.001$) and coronary calcifications (27.6% v 19.5%, $p = 0.014$) but fewer successful PCI procedures (86.6% v 95.2%, $p < 0.001$) compared with patients without DM. Mortality after one year's follow up was 8.9% ($n = 113$) in the whole cohort, 17.8% for patients with DM, and 7.2% for patients without DM (OR 2.9, 95% CI 1.8 to 4.3, $p < 0.001$). Of the 174 patients with DM, 126 (72.4%) were taking oral treatment (NIDDM) and 48 (27.8%) were taking insulin (IDDM) at admission. Baseline and angiographic characteristics did not differ between patients with IDDM and those with NIDDM. IDDM patients tended to have more coronary calcifications (37.5% v 23.8%, $p = 0.071$) and less successful PCI (81.3% v 88.9%, $p = 0.184$) than patients with NIDDM. Mortality was 27.1% for patients with IDDM and 14.3% for patients with NIDDM (OR 2.2, 95% CI 1.0 to 5.0, $p < 0.05$). Multivariate analysis showed that significant independent predictors for mortality were cardiogenic shock at presentation, PCI failure, IDDM, NIDDM, and coronary calcifications (table 1).

DISCUSSION

This study confirms that even with the reperfusion treatment of choice, patients with STEMI and DM have a greater long term mortality than do patients without DM. They have different baseline characteristics from patients without DM. Patients with DM also present with a higher incidence of cardiogenic shock, possibly at least partly due to a longer ischaemic time. Furthermore, more patients with than without DM had PCI failure possibly also as a consequence of a longer ischaemic time. Some angiographic differences may also partly explain the difference in PCI success. Both coronary calcifications and a higher rate of multivessel disease are also associated with more complicated PCI procedures and were more common among patients with DM.

The second finding is that preadmission treatment for DM is an independent predictor for one year mortality. Patients requiring insulin have longstanding type 1 DM or type 2 DM without adequate glycaemic regulation with oral medication. These patients with IDDM mostly have longstanding DM and mortality of those with type 2 DM receiving insulin at admission is about four times higher than that of patients without DM and two times higher than that of patients with DM taking oral medication at admission. In our study about 13% of the patients had a previous diagnosis of DM. Of all the

Abbreviations: DM, diabetes mellitus; IDDM, insulin dependent diabetes mellitus; NIDDM, non-insulin dependent diabetes mellitus; PCI, percutaneous coronary intervention; STEMI, ST segment elevation myocardial infarction

Table 1 Independent predictors of one year mortality in 1308 patients with ST elevation myocardial infarction treated with primary percutaneous coronary intervention

	RR*	95% CI	p Value
Shock at presentation†	5.405	3.311 to 8.771	<0.001
PCI failure†	3.127	1.586 to 6.166	0.001
IDDM‡§	3.246	1.219 to 8.695	0.018
NIDDM‡§	2.673	1.248 to 5.714	0.011
Coronary calcification†	1.680	1.016 to 2.777	0.043
Family history	1.452	0.880 to 2.396	0.144
Multivessel disease	1.412	0.869 to 2.293	0.163
Age >60 years	1.402	0.808 to 2.439	0.229
Men	1.206	0.717 to 2.028	0.479
Ischaemic time >180 min	1.206	0.766 to 1.901	0.417
Previous events§	1.184	0.710 to 1.976	0.515
Hypertension	1.082	0.662 to 1.766	0.753
Smoking	0.801	0.493 to 1.302	0.371
Hypercholesterolaemia	0.704	0.393 to 1.261	0.238

*Cox regression analysis; †significant predictor; ‡diabetes was entered as a categorical variable (no diabetes, NIDDM, or IDDM); §previous PCI, STEMI, or coronary artery bypass grafting.

CI, confidence interval; IDDM, insulin dependent diabetes mellitus (patients treated with insulin); NIDDM, non-insulin dependent diabetes mellitus (patients treated orally); RR, relative risk.

patients with DM about 28% were taking insulin at admission, in agreement with large registries.

As a limitation, we did not routinely estimate haemoglobin A_{1c} or test for DM on admission or during follow up. Despite the relatively large sample size, the absolute number of patients in each DM category is somewhat small. Only 23% of all patients were treated with abciximab.

Patients with acute STEMI with diagnosed DM more often present with cardiogenic shock and have more severe coronary disease and PCI failure. After primary PCI for STEMI, the one year mortality rate is 7.2% for patients without DM and 17.8% for patients with DM. For patients with DM taking oral medication at the time of admission for

STEMI, the one year mortality is 14.3% and for those taking insulin mortality is 27.1%. Preadmission treatment for DM is an independent predictor of one year mortality. Even after primary PCI for acute STEMI, patients with DM treated with insulin form a subgroup with a mortality about four times higher than that of patients without DM and two times higher than that of patients with DM treated with oral medication in daily, real life clinical practice.

Authors' affiliations

R J van der Schaaf, J P S Henriques, J J Wiersma, K T Koch, J Baan Jr, K J J Mulder, J D Durrer, J G P Tijssen, J J Piek, R J de Winter, Department of Cardiology, Academic Medical Centre, Amsterdam, the Netherlands

There are no conflicts of interest or financial disclosure

Correspondence to: Dr José P S Henriques, Department of Cardiology, Academic Medical Centre, Meibergdreef 9, 1105 AZ Amsterdam, Netherlands; j.p.henriques@amc.uva.nl

Accepted 4 May 2005

REFERENCES

- 1 Mak KH, Moliterno DJ, Granger CB, *et al*. Influence of diabetes mellitus on clinical outcome in the thrombolytic era of acute myocardial infarction. GUSTO-1 Investigators. Global utilization of streptokinase and tissue plasminogen activator for occluded coronary arteries. *J Am Coll Cardiol* 1997;**30**:171–9.
- 2 Hsu LF, Mak KH, Lau KW, *et al*. Clinical outcomes of patients with diabetes mellitus and acute myocardial infarction treated with primary angioplasty or fibrinolysis. *Heart* 2002;**88**:260–5.
- 3 Zairis MN, Lyras AG, Makrygiannis SS, *et al*. Type 2 diabetes and intravenous thrombolysis outcome in the setting of ST elevation myocardial infarction. *Diabetes Care* 2004;**27**:967–71.
- 4 Timmer JR, Ottervanger JP, Thomas K, on behalf of the Zwolle myocardial infarction study group, *et al*. Long-term, cause-specific mortality after myocardial infarction in diabetes. *Eur Heart J* 2004;**25**:926–31.
- 5 Keeley EC, Boura JA, Grines CL. Primary angioplasty versus intravenous thrombolytic therapy for acute myocardial infarction: a quantitative review of 23 randomised trials. *Lancet* 2003;**361**:13–20.

IMAGES IN CARDIOLOGY

doi: 10.1136/hrt.2005.067645

Myocardial ischaemia in a patient with anomalous left coronary artery from the pulmonary artery



A 52 year old man presented with near syncope while standing in a bus. An ECG showed widespread T wave inversion involving lead V1–4, I, aVL. Myocardial infarction was ruled out on subsequent cardiac enzyme assays. A dobutamine stress echocardiogram showed abnormal wall motion in the left anterior descending artery territory during stress. Cardiac catheterisation showed a large right coronary artery collateralising the left coronary artery, which emptied into the pulmonary artery (panel). There was no significant coronary artery disease and the left ventricular systolic function was normal. The calculated left to right shunt (Qp:Qs ratio) was 1.07.

Anomalous left coronary artery from the pulmonary artery is a rare, congenital cardiac anomaly accounting for approximately 0.25–0.5% of all congenital heart disease. It is usually an isolated cardiac anomaly but, in rare incidences, has been described with patent ductus arteriosus, ventricular septal defect, tetralogy of Fallot, and coarctation of the aorta. Collateral circulation between the right and left coronary systems ensues after birth and the left ventricular myocardium is chronically underperfused, since flow is preferentially directed into the pulmonary vascular bed and away from the left ventricular myocardium due to the low pulmonary vascular resistance (coronary steal phenomena). Left untreated, the mortality rate in the first year of life is 90% secondary to myocardial ischaemia or infarction and congestive heart failure. In rare cases, the clinical presentation of myocardial ischaemia may be delayed into early childhood, or even adulthood as in our patient, when intracardiac shunt is minimal.

C Y Soon
E Wee
H C Tan
sooncy@gmail.com