Diabetes mellitus type 2 and angina pectoris: novel insights in diagnosis, prognosis and treatment
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Chapter 9

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

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Abstract

Objective
Acute ST segment elevation myocardial infarction (STEMI) patients with diabetes constitute a high risk patient group. Primary angioplasty (PCI) is the optimal treatment for STEMI. There is limited information about outcome in diabetic patients treated with PCI. We studied 1 year mortality in STEMI patients with and without diabetes, treated with PCI.

Methods
From 1308 STEMI patients treated with PCI, 174 (13.3%) patients had diabetes mellitus. Diabetics were categorized according to preadmission therapy: oral (NIDDM) or insulin (IDDM) therapy. Follow-up was 1 year.

Results
Mortality was 7.2% in non-diabetics and 17.8% in diabetic patients (OR 2.9, 95%CI 1.8-4.3, p<0.001). Mortality rate was 14.3% in NIDDM (n=125) and 27.1% in IDDM (n=48) patients (OR 2.2, 95%CI: 1.0-5.0, p<0.05). Diabetic patients presented more often with cardiogenic shock (OR 1.6, 95%CI: 1.0-1.7, p=0.03), had more often coronary calcifications (OR 1.6, 95%CI: 1.1-2.3, p=0.01) and more PCI failure (OR 3.0, 95%CI: 1.8-5.1, p<0.001) compared with non-diabetic patients. Independent predictors for mortality were: shock (OR 5.4 95%CI: 3.3-8.7, p<0.001), PCI failure (OR 3.1, 95%CI:1.6-6.2, p=0.001) IDDM (OR 3.2, 95%CI:1.2-8.7, p=0.018), NIDDM (OR 2.7, 95%CI:1.2-5.7, p=0.011) and coronary calcifications (OR 1.7, 95%CI:1.0-2.7, p=0.043).

Conclusions
STEMI patients with diabetes mellitus more often present with shock, have more severe coronary artery disease and more often have PCI failure. IDDM patients have a 2 times higher mortality rate compared with NIDDM and an approximately 4 times higher mortality rate compared with patients without diabetes.
Introduction

Patients with acute ST segment elevation myocardial infarction (STEMI) with diabetes mellitus have an increased mortality and morbidity when compared with patients without diabetes mellitus. Information is limited about clinical outcome of patients with STEMI and diabetes treated with reperfusion. Furthermore, diabetic patients have a higher rate of thrombolysis failure. Information is also limited on long-term outcome of patients with diabetes mellitus treated with primary percutaneous coronary intervention (PCI), which is the reperfusion treatment of choice. We therefore studied one year mortality among patients with and without diabetes mellitus in a large cohort of patients with acute STEMI treated with primary PCI. Furthermore, we studied the impact of preadmission antidiabetic treatment, 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 diabetes 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 diabetes mellitus or as having an established diagnosis of diabetes at admission. Diabetic patients were categorised according to preadmission treatment: either with oral medication or diet controlled (non-insulin dependent diabetes mellitus (NIDDM)) or with insulin (insulin dependent diabetes mellitus (IDDM)). IDDM comprised both type 1 and type 2 diabetes mellitus. 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 diabetes mellitus at admission. Patients with diabetes were older (<60 years; 44.4% v 64.4%, p < 0.001) and fewer of them were men (64.9% vs. 74.9%, p = 0.006) or smokers (34.5% vs. 55.2%, p < 0.001). More of the diabetic patients were hypertensive (49.4% vs. 31.7%, p < 0.001), had a previous coronary event (previous PCI, STEMI, or coronary bypass grafting: 40.8% vs. 20.3%, p < 0.001), or had a long ischemic time (> 3 hours) (54.7% vs. 44.3%, p = 0.027) compared with patients without diabetes mellitus. Diabetic patients had a higher incidence of cardiogenic shock at admission (13.2% vs. 8.3%, p = 0.034) and more of them needed intra-aortic balloon counter pulsation (12.1% vs. 5.6%, p < 0.001). Diabetic patients had more multivessel disease (55.7% vs. 37.9%, p < 0.001) and coronary calcifications (27.6% vs. 19.5%, p = 0.014) but fewer successful PCI procedures (86.6% vs. 95.2%, p < 0.001) compared with non-diabetic patients. Mortality after one year’s follow up was 8.9% (n = 113) in the whole cohort, 17.8% for patients with diabetes, and 7.2% for patients without (OR 2.9, 95% CI 1.8 to 4.3, p < 0.001). Of the 174 patients with diabetes, 126 (72.4%) were taking oral treatment (NIDDM) and 48 (27.8%) were taking insulin (IDDM) at admission. Baseline and angiographic characteristics did not

| Table 1. Independent predictors of 1 year mortality in 1308 STEMI patients treated with primary PCI. |
|-------------------------------------------------|---------------------------------|-----------------|-----------------|
| Relative risk (RR)*    | 95% CI              | p-value       |
| Shock at presentation  | 5.405               | 3.311 – 8.771 | <0.001         |
| PCI failure            | 3.127               | 1.586 – 6.166 | 0.001          |
| IDDM**                | 3.246               | 1.219 – 8.695 | 0.018          |
| NIDDM**               | 2.673               | 1.248 – 5.714 | 0.011          |
| Coronary calcifications| 1.680               | 1.016 – 2.777 | 0.043          |
| Family history         | 1.452               | 0.880 – 2.396 | 0.144          |
| Multivessel disease    | 1.412               | 0.869 – 2.293 | 0.163          |
| Age >60 years          | 1.402               | 0.808 – 2.439 | 0.229          |
| Male                  | 1.206               | 0.717 – 2.028 | 0.479          |
| Ischemic time >180 minutes| 1.206             | 0.766 – 1.901 | 0.417          |
| Previous event         | 1.184               | 0.710 – 1.976 | 0.515          |
| Hypertension           | 1.082               | 0.662 – 1.766 | 0.753          |
| Smoking                | 0.801               | 0.493 – 1.302 | 0.371          |
| Hypercholesterolaemia  | 0.704               | 0.393 – 1.261 | 0.238          |

STEMI: ST segment elevation myocardial infarction, PCI: percutaneous coronary intervention, NIDDM: patients with diabetes on oral therapy, IDDM: patients with diabetes on insulin therapy. Previous event: previous PCI or STEMI or coronary artery bypass grafting. * RR taken from the Cox regression analysis. Significant predictors are in bold ** Diabetes was entered as a categorical variable (no diabetes:NIDDM;IDDM)
differ between patients with IDDM and those with NIDDM. IDDM patients tended to have more coronary calcifications (37.5% vs. 23.8%, p = 0.071) and less successful PCI (81.3% vs. 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, diabetic patients with STEMI have greater long term mortality than do patients without diabetes mellitus. Diabetic patients have different baseline characteristics and also present with a higher incidence of cardiogenic shock, possibly at least partly due to a longer ischemic time. Furthermore, more patients with than without diabetes 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 diabetes mellitus. The second finding is that preadmission treatment for diabetes mellitus is an independent predictor for one year mortality. Patients requiring insulin have longstanding type 1 or type 2 diabetes mellitus without adequate glycemic regulation with oral medication. These patients with IDDM mostly have longstanding disease and mortality of those with type 2 diabetes mellitus receiving insulin at admission is about four times higher than that of patients without diabetes mellitus and two times higher than that of patients with diabetes taking oral medication at admission. In our study about 13% of the patients had a previous diagnosis of diabetes. Of all the diabetic patients about 28% were taking insulin at admission, in agreement with large registries. As a limitation, we did not routinely estimate haemoglobin A1c or test for diabetes mellitus on admission or during follow up. Despite the relatively large sample size, the absolute number of patients in each diabetic category is somewhat small. Only 23% of all patients were treated with abciximab. Patients with acute STEMI with diagnosed diabetes mellitus 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 and 17.8% for patients with diabetes. For diabetic patients 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 diabetes mellitus is an independent predictor of one year mortality. Even after primary PCI for acute STEMI, diabetic patients treated with insulin form a subgroup with mortality about four times higher than that of non-diabetic patients and two times higher than that of diabetics treated with oral medication in daily, real life clinical practice.
Reference List


(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 September;88(3):260-5.

