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Original article

Dysglycemia in suspected acute coronary syndromes

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Abstract

Background: Apart from diabetes itself, even minor glycometabolic dysregulation may be associated with an increased risk of cardiovascular disease. We analyzed the prevalence and predictive value of glycometabolic disturbances in patients with a suspected acute coronary syndrome (ACS).
Methods: In a prospective follow-up study, admission glucose and Hba1C levels in all consecutive patients with suspected ACS were measured. Dysglycemia was defined as a Hba1C of 5.6–6.1% with a non-fasting glucose above 7.8 mmol/L. Both predictors of glycometabolic disturbances and the predictive value of glycometabolic disturbances were studied.
Results: Of the 521 patients with a suspected ACS who were included in the study, 332 (64%) had an ACS and 189 (36%) had atypical chest pain. A total of 115 patients (22%) had diabetes and 65 (13%) had dysglycemia. Patients with diabetes or dysglycemia had an increased risk of a confirmed diagnosis of ACS (RR 2.3, 95% CI 1.5–3.4). Multivariate analyses did not change these findings.
Conclusions: One in three patients with suspected ACS had a glucose metabolism disturbance. Glycometabolic disturbance was strongly associated with a confirmed diagnosis of ACS. Whether intensive treatment of patients with disturbed glucose metabolism may improve long-term prognosis needs to be assessed.

Keywords: Blood glucose; Chest pain; Unstable angina; Myocardial infarction

1. Introduction

Cardiovascular morbidity and mortality are increased in patients with diabetes [1,2]. Glycometabolic dysregulation in patients without diabetes may also be a risk factor for the development of atherosclerosis [3]. Although there are some data regarding the glycometabolic state in specific subgroups of patients, little is known about the prevalence of glycometabolic dysregulation in a patient population presenting with suspected acute coronary syndromes (ACS) [4–6]. We therefore analyzed and compared glycometabolic metabolism in all consecutive patients with chest pain complaints visiting our cardiologic emergency department. We investigated whether the glycometabolic state on admission was of predictive value with regard to the presence of coronary artery disease (CAD) and a confirmed diagnosis of ACS.

2. Materials and methods

2.1. Patients

A single-center, prospective, follow-up study was conducted from October 2002 to March 2003. During the 5-month study period, all consecutive patients admitted to the emergency department with a suspected ACS were included in this analysis. If patients returned to our hospital with

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cardiac complaints during the study period, only the first visit was recorded. Medical data from the patient's medical record were collected in a database. Patients were included if they had ST segment elevation myocardial infarction (STEMI) or non-ST segment ST elevation myocardial infarction (Non-STEMI) or specific chest pain complaints. All patients with electrocardiographic ST segment elevation on admission underwent immediate coronary angiography; percutaneous intervention was performed when indicated.

2.2. Laboratory measurements

Hba1C was measured using high-performance liquid chromatography (HPLC) (Primus). This method has an interassay coefficient of variation of 0.51%. Glucose was measured using a modular-analytics device (Roche).

2.3. Definitions of clinical diagnosis

STEMI was defined as the presence of chest pain, electrocardiographic evidence of myocardial ischemia or infarction, and a subsequent rise in CK values above 200 U/L. Non-STEMI was defined as chest pain at rest, accompanied by electrocardiographic evidence of ischemia or an elevation of cardiac troponin above threshold levels. Atypical chest pain was diagnosed as chest pain not attributable to myocardial ischemia or other (non) cardiac causes of chest discomfort, with a normal electrocardiogram and without troponin elevation. Patients with a non-ischemic clinical diagnosis likely to cause chest pain complaints (i.e., pneumonia or stenotic valvular disease) were excluded from the analysis. Previous CAD was defined as a history of myocardial infarction, coronary artery bypass grafting, or percutaneous coronary intervention.

2.4. Definitions of disturbances in glucose metabolism

Diabetes was defined as the use of insulin or glucose-lowering medication on admission or a diet for diabetes documented in the medical history. Newly detected diabetes was defined as a Hba1C level of 6.2% or more [7]. Dysglycemia was defined as a Hba1C of 5.6–6.1% in combination with a non-fasting glucose level above 7.8 mmol/L. All other patients were considered to be normoglycemic.

2.5. Statistical analysis

Statistical analysis was performed using SPSS 10.0. Differences between group means were tested with a two-tailed Student's *t*-test. A chi-square statistic was calculated to test differences between proportions, with calculation of relative risks and exact 95% confidence intervals. Fisher's exact test was used when the expected value of cells was below 5. Statistical significance was defined as a *P* value below 0.05. Admission glucose was included as a categorized and continuous variable. Comparison of means from continuous data between more than two patient groups was performed using a one-way ANOVA analysis. Logistic regression analysis was used to estimate hazard ratios.

3. Results

During the 5-month study period, 521 patients were evaluated. Their mean age was 63±13 years and 61% were male. An ACS was diagnosed in 332 patients (64%); 189 patients had atypical chest pain. The majority of the 189 patients (78%) had no identifiable pathological cause of chest pain complaints, 11% had thoracomuscular pain, and 11% had gastrointestinal reflux complaints.

3.1. Glycometabolic parameters

Of the 521 patients, 79 (15%) had known diabetes, whereas previously undiagnosed diabetes was present in 36 patients (7%), resulting in 115 patients with diabetes (22%). Patients with diabetes were older, more often female, and more often had a history of CAD and/or hypertension. In patients with known diabetes, 25 (32%) had insulin as anti-diabetic treatment and 52 (66%) had oral anti-diabetic therapy. A total of 65 patients (13%) had dysglycemia. Patients with dysglycemia were older and less often had a family history of CAD compared to patients with normoglycemia. Baseline characteristics of patients with normoglycemia, dysglycemia, and diabetes are shown in Table 1. The prevalence of glycometabolic disturbances according to the presence of CAD is shown in Fig. 1. Known diabetes was particularly associated with a history of CAD, whereas dysglycemia was strongly associated with a first manifestation of CAD. Dysglycemia was present in 2% of the patients without CAD, in 8% of those with known CAD, and in 22% of those with a first manifestation of CAD ($p<0.001$). None of the patients with previously undiagnosed diabetes received oral hypoglycemic agents or insulin at discharge.

3.2. Predictive value

An ACS was diagnosed in 332 patients (64%), with ST-elevation in 237 (71%). Patients with an ACS were older and more often male compared to patients without an ACS. Baseline characteristics of patients with and without an ACS are shown in Table 2. Both mean glucose (9.0±3.8 vs. 6.8±2.2 mmol/L, $p<0.001$) and mean Hba1C (5.9±1.0 vs. 5.8±0.9, $p=0.17$) were higher in patients with an ACS. Also, in patients without known diabetes but with an ACS, mean glucose (8.2±2.8 vs. 6.2±1.2, $p<0.001$) and mean Hba1C (5.7±0.5 vs. 5.6±0.4, $p<0.01$) were higher. The prevalence of glycometabolic disturbances according to clinical diagnosis (ACS or no ACS) is shown in Fig. 2.