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Blood glucose level on admission determines in-hospital and long-term mortality in patients with ST-segment elevation myocardial infarction complicated by cardiogenic shock treated with percutaneous coronary intervention

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Abstract

Background: It has been shown that hyperglycaemia is associated with increased in-hospital and long-term mortality in patients with myocardial infarction (MI). There are only a few reports on the relationship between glycaemia in the acute phase of MI complicated by cardiogenic shock (CS) and prognosis.

Aim: To assess the relationship between blood glucose level on admission and in-hospital as well as long-term mortality in patients with acute ST-segment elevation MI (STEMI) complicated by CS treated with percutaneous coronary intervention (PCI).

Methods: Consecutive patients with STEMI complicated by CS treated with PCI were included. For the purpose of this analysis, the patients were divided into two groups: the first group included patients with glycaemia on admission < 7.8 mmol/L, and the other group patients with glycaemia ≥ 7.8 mmol/L (hyperglycaemia group). Selected parameters from the in-hospital and long-term follow-up were compared between the two groups. Due to a possible linear relationship between blood glucose and mortality in multivariate analysis, glucose level on admission was treated as a continuous variable. The primary outcomes included in-hospital, 1-year and 5-year mortality.

Results: Out of 3166 consecutive patients with STEMI, 258 had CS and available data on glycaemia. In patients with hyperglycaemia on admission, we observed higher in-hospital (41.5% *vs* 28%, p = 0.041), 1-year (51.4% *vs* 34.7%, p = 0.015) and 5-year (65.8% *vs* 43.3%, p = 0.034) mortality in comparison to the patients with blood glucose < 7.8 mmol/L. The multivariate analysis revealed that blood glucose level on admission (per each glycaemia increment by 1 mmol/L) was an independent prognostic factor of in-hospital (OR 1.08, 95% CI 1.02–1.14, p = 0.0044), 1-year (HR 1.04, 95% CI 1.01–1.06, p = 0.005) and 5-year mortality (HR 1.03, 95% CI 1.01–1.05, p = 0.045). Of note, the diagnosis of diabetes mellitus had no influence on in-hospital and long-term mortality.

Conclusions: Elevated blood glucose level on admission, regardless of the diagnosis of diabetes mellitus, results in increased in-hospital and long-term mortality in patients with STEMI complicated by CS and treated with PCI.

Key words: hyperglycaemia, myocardial infarction, cardiogenic shock

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INTRODUCTION

Blood glucose level in the acute phase of myocardial infarction (MI) affects in-hospital and long-term mortality. Higher glycaemia on admission is also associated with increased incidence of stroke and adverse cardiovascular event during long-term follow-up [1–3]. Adverse outcomes may be related to the fact that patients with higher blood glucose level on admission are older and more frequently have hypertension and diabetes, suffered from a previous MI, and present with acute anterior MI [4, 5]. Hyperglycaemia in acute MI is an independent prognostic factor of more impaired initial flow in the infarct-related artery and the occurrence of the no-reflow phenomenon [6, 7]. In addition, patients with hyperglycaemia are characterised with higher level of cardiac necrosis markers and lower left ventricular ejection fraction (LVEF) [5, 8]. Higher incidence of cardiogenic shock (CS) has also been observed among such patients [1, 2]. This observation is important as the occurrence of CS is a strong predictor of higher mortality [9, 10]. It would be interesting to determine whether blood glucose on admission may have an effect on mortality in patients with MI complicated by CS. However, only few inconsistent reports have been published regarding this issue. Thus, we evaluated a relationship between blood glucose level on admission and in-hospital and long-term mortality among patients with acute ST-segment elevation MI (STEMI) complicated by CS who were treated with percutaneous coronary intervention (PCI).

METHODS

Study group

We analysed consecutive patients with STEMI complicated with CS who were treated with PCI in 1998–2006 and had available data on blood glucose level on admission. Cardiogenic shock was diagnosed based on clinical findings (cold, clammy skin, oliguria or anuria) and haemodynamic criteria including systemic systolic blood pressure < 90 mm Hg or decrease by 30 mm Hg compared to baseline lasting for at least 30 min without the use of inotropic support or intraaortic balloon pump (IABP), or systolic blood pressure > 90 but < 110 mm Hg with the use of inotropic support or IABP.

Urgent coronary angiography was performed in patients with continuing anginal pain lasting for ≥ 30 min, electrocardiographic pattern of acute MI, i.e. ST segment elevation ≥ 0.1 mV in ≥ 2 limb leads or ≥ 0.2 mV in ≥ 2 precordial leads or new left bundle branch block, with time from the onset of pain to revascularisation of not more than 18 hours. Epicardial coronary artery flow was assessed using Thrombolysis in Myocardial Infarction (TIMI) flow grades [11]. Successful PCI was defined as TIMI 3 flow with residual stenosis $\leq 30\%$ without evidence of flow-limiting coronary artery dissection. The IABP was used depending on the patient clinical condition.

After PCI, patients were transferred to an intensive coronary care unit. In case of recurrent pain and ST segment elevation patients were referred for immediate coronary angiography, and repeat PCI was performed if reocclusion or significant stenosis of the infarct-related artery was found.

During the following days, patients were administered oral aspirin, ticlopidine or clopidogrel, beta-blockers, angiotensin-converting enzyme inhibitors, and statin if not contraindicated. All patients with detected diabetes or hyperglycaemia in the acute phase of MI without previous diagnosis of diabetes were treated with short-acting insulin given in intravenous infusion or subcutaneous injections. In patients with diabetes following the acute phase of MI, we returned to previous diabetes treatment if daily insulin requirement was less than 30 U. In patients with diabetes diagnosed following the acute phase of MI, we initiated oral hypoglycaemic drugs and diet if daily insulin requirement was less than 30 U. All other patients remained on insulin given in multiple daily injections. Data regarding clinical and angiographic characteristics and in-hospital and long-term outcomes were documented in a database. Long-term outcomes were established based on questionnaires, phone calls and information gained from a national registry of hospitalisations and invasive in-hospital procedures run by the National Health Fund (*Narodowy Fundusz Zdrowia*).

Blood glucose level on admission, diabetes diagnosis, and study groups

Blood glucose level on admission was measured in the emergency room. For the purpose of this analysis, the patients were divided into two groups depending on glycaemia on admission, regardless of any previous diagnosis of diabetes. The first group included patients with glycaemia on admission < 7.8 mmol/L, and the other group patients with glycaemia ≥ 7.8 mmol/L.

The presence of diabetes was determined based on clinical history (established diabetes treated with insulin, oral hypoglycaemic drugs or diet) or hyperglycaemia during hospitalisation (at least two measurements of fasting blood glucose level ≥ 7 mmol/L after the acute phase of MI or blood glucose level ≥ 11.1 mmol/L in predischarge oral glucose tolerance test [OGTT]).

Endpoints

The primary outcomes included in-hospital, 1-year and 5-year mortality (analysed in 106 patients). The relation on blood glucose level on admission and mortality was analysed in groups defined as above.

Statistical analysis

Normally distributed continuous variables are presented as means ± standard deviations. Differences in mean values were compared using the Student *t* test. Categorical variables were compared using the chi-square test (with the Yates correction if the expected number of observations was less than 5). The

Table 1. Clinical characteristics of the study groups

Parameter	Blood glucose on admission		P
	< 7.8 mmol/L (n = 75)	≥ 7.8 mmol/L (n = 183)	
Age [years]	60.5 ± 11.1	63.2 ± 10.6	0.07
Females [%]	30.7	36.1	0.41
Hypertension [%]	40.9	54.0	0.06
Hypercholesterolaemia [%]	50.0	40.7	0.18
Smoking [%]	60.6	41.1	0.006
Diabetes [%]	20.0	35.0	0.018
Previous MI [%]	28.4	32.0	0.57
Time from the onset of chest pain to admission [h]	6.4 ± 4.1	6.3 ± 3.7	0.95
Fibrinolysis before PCI [%]	20.0	20.8	0.89
Anterior wall MI [%]	39.2	42.1	0.67

MI — myocardial infarction; PCI — percutaneous coronary intervention

effects of the evaluated parameters on mortality were assessed using the Kaplan-Meier method, log-rank test, and multivariate logistic regression (for in-hospital mortality) or multivariate Cox proportional hazard regression models (for 1-year and 5-year mortality), with results expressed as odds ratios (OR) or hazard ratios (HR) and 95% confidence intervals (CI). Two-sided p value < 0.05 was considered statistically significant. Due to a possible linear relationship between blood glucose and mortality in multivariate analysis, glucose level on admission was treated as a continuous variable. All calculations and statistical analyses were performed using Statistica PL software, version 7.0 (StatSoft Inc.).

RESULTS

Among 3166 consecutive patients with STEMI treated with PCI, we identified 312 (8.9%) patients with CS. The present analysis included 258 patients with available data on blood glucose level on admission. Group I (blood glucose level on admission < 7.8 mmol/L) included 75 patients (15 patients with diabetes), and Group II (blood glucose level on admission ≥ 7.8 mmol/L) included 183 patients (64 with diabetes).

Clinical characteristics

Among patients with blood glucose level on admission ≥ 7.8 mmol/L, we identified significantly fewer smokers and more patients with diabetes compared to patients with blood glucose level on admission < 7.8 mmol/L. We also found a trend towards older age and more frequent hypertension in the former group. Clinical characteristics of the study groups are shown in Table 1.

Angiographic characteristics

Coronary angiography showed no significant differences in the rates of initial TIMI 0–1 flow in the infarct-related artery, multivessel coronary artery disease, and stent implantation between the study groups. We found significantly lower effectiveness of PCI (defined as TIMI 3 flow at the end of the procedure) in patients with hyperglycaemia compared with patients with blood glucose level on admission < 7.8 mmol/L (67.2% *vs* 79.5%). However, when we compared patients with or without diabetes regardless of the presence of hyperglycaemia, we found similar rates of postprocedural TIMI 3 flow in the two groups (65.4% *vs* 72.9%, p = 0.20). Angiographic data are shown in Table 2.

Laboratory parameters

Mean blood glucose level on admission was 6.4 ± 1.1 mmol/L in Group I and 15.1 ± 6.5 mmol/L in Group II. Patients with hyperglycaemia had lower platelet count on admission compared to patients with blood glucose level on admission < 7.8 mmol/L. We found no differences between the two groups in regard to serum creatinine level, lipid profile and peak creatine kinase or creatine kinase-MB activity. Laboratory parameters are shown in Table 3.

Primary outcomes during in-hospital and long-term follow-up

Overall in-hospital, 1-year and 5-year mortality among patients with STEMI complicated with CS was 37.6%, 46.5%, and 59.4%, respectively. Along with blood glucose level on admission ≥ 7.8 mmol/L, we found significantly higher in-hospital mortality compared to patients with blood glucose level on admission < 7.8 mmol/L, with similar difference seen during the long-term follow-up. In-hospital and long-term outcomes are shown in Table 4. Multivariate analysis revealed that blood glucose level on admission (per each glycaemia increment by 1 mmol/L) was an independent prognostic factor of in-hospital (OR 1.08, 95% CI 1.02–1.14, p = = 0.0044), 1-year (HR 1.04, 95% CI 1.01–1.06, p = 0.005), and 5-year mortality (HR 1.03, 95% CI 1.01–1.05, p = 0.045). Of note, the diagnosis of diabetes mellitus had no influence on in-hospital (OR 0.78, 95% CI 0.37–1.67;

Table 2. Angiographic characteristics of the study groups

Parameter	Blood glucose on admission		P
	< 7.8 mmol/L (n = 75)	≥ 7.8 mmol/L (n = 183)	
Infarct-related artery [%]			0.39
RCA	36.3	42.0	
Cx	25.0	9.8	
LAD	37.2	42.0	
LM	1.5	6.2	
Initial TIMI 0–1 flow [%]	89.2	85.8	0.47
Final TIMI 3 flow [%]	79.5	67.2	0.046
Multivessel CAD [%]	67.6	71.0	0.84
Stent implantation [%]	72.0	67.2	0.45
IABP [%]	24.0	24.2	0.98

RCA — right coronary artery; Cx — left circumflex artery; LAD — left anterior descending artery; LM — left main coronary artery; TIMI — Thrombolysis in Myocardial Infarction; CAD — coronary artery disease; IABP — intraaortic balloon pump

Table 3. Laboratory parameters in the study groups

Parameter	Blood glucose on admission		P
	< 7.8 mmol/L (n = 75)	≥ 7.8 mmol/L (n = 183)	
Mean blood glucose on admission [mmol/L]	6.4 ± 1.1	15.1 ± 6.5	0.00001
Mean erythrocyte count on admission [M/mm^3]	4.5 ± 0.5	4.4 ± 0.6	0.56
Mean leukocyte count on admission [10^3/mm^3]	15.0 ± 6.2	15.3 ± 4.9	0.70
Mean haemoglobin level on admission [mmol/L]	8.8 ± 1.0	8.6 ± 1.3	0.23
Mean platelet count on admission [10^3/mm^3]	245.5 ± 96.5	216.9 ± 94.6	0.04
Mean serum creatinine on admission (μmol/L)	118.1 ± 87.8	126.8 ± 74.5	0.50
Mean total cholesterol [mmol/L]	5.7 ± 1.7	6.2 ± 2.1	0.55
Mean LDL-cholesterol [mmol/L]	3.6 ± 1.6	4.6 ± 1.9	0.36
Mean HDL-cholesterol [mmol/L]	1.26 ± 0.4	2.3 ± 0.6	0.3
Mean triglyceride level [mmol/L]	1.6 ± 0.4	2.4 ± 0.7	0.45
Peak CK activity [IU/L]#	3172.0 ± 1670.4	2954.1 ± 1564.8	0.69
Peak CK-MB activity [IU/L]*	171.7 ± 72.1	222.3 ± 97.2	0.19

#Data for 133 patients; *data for 101 patients; CK — creatine kinase; CK-MB — creatine kinase MB isoenzyme

p = 0.52), 1-year (HR 0.97, 95% CI 0.64–1.49, p = 0.89), and 5-year mortality (HR 1.21, 95% CI 0.63–2.31, p = 0.57) (Figs. 1–3).

DISCUSSION

Prognosis in patients with MI complicated by CS

Cardiogenic shock is a significant adverse factor leading to increased mortality in patients with MI [10, 12]. Revascularisation improves outcomes in this group. In the SHOCK Trial Registry, in-hospital mortality in patients treated with coronary artery bypass grafting (CABG) or PCI was lower than in medically treated patients [13]. In this study, a similar advantage of invasive approach was also seen for 6-month mortality which was 50.3% in the revascularisation group compared to 63.1% in the medical treatment group. In multivariate analysis, revascularisation was an independent prognostic factor of lower 6-month mortality [14]. However, mortality in patients with CS remains high despite the use of PCI and CABG. Therefore, identification of independent adverse prognostic factors seems necessary in these patients.

Relationship between blood glucose level on admission and outcomes in patients with CS

Impaired glucose metabolism was found to affect the incidence of CS and outcomes in these patients. Zeller et al. [15] showed that abnormal fasting glucose level measured 4–5 days following MI was associated with more frequent occurrence of CS. In addition, abnormal fasting glycaemia was an independent prognostic factor of CS in multivariate analysis (OR 2.840, 95% CI 1.077–7.488). Vis et al. [16] studied the effect

Table 4. In-hospital and long-term outcomes

Parameter	Blood glucose on admission		P
	< 7.8 mmol/L (n = 75)	≥ 7.8 mmol/L (n = 183)	
LVEF [%]	38.4 ± 11.3	37.6 ± 10.4	0.66
Gastrointestinal bleeding [%]	4.0	8.8	0.18
PCI-related haematoma [%]	2.7	2.8	0.97
Blood transfusion [%]	6.7	8.3	0.66
Urgent repeat PCI [%]	9.3	15.3	0.27
Elective repeat PCI [%]	5.3	3.9	0.59
Urgent CABG [%]	2.7	3.5	0.74
Elective CABG [%]	4.0	2.2	0.43
In-hospital mortality [%]	28.0	41.5	0.041
Mean duration of hospitalisation [days]	9.6 ± 3.2	7.2 ± 2.1	0.01
Medications on discharge [%]			
Aspirin	92.0	89.9	0.75
Ticlopidine/clopidogrel	76.9	76.8	0.99
Beta-blocker	96.2	83.8	0.11
Angiotensin-converting enzyme inhibitor	69.2	58.2	0.33
Calcium channel blocker	0.0	4.7	0.26
Nitrate	76.9	55.9	0.63
Statin	80.8	71.6	0.37
Insulin**	33.3	47.1	0.46
Oral hypoglycaemic drugs**	66.7	52.9	0.61
1-year mortality [%]	34.7	51.4	0.015
5-year mortality [%] *	43.3	65.8	0.034

*Data for 106 patients; **in patients with diabetes; LVEF — left ventricular ejection fraction; PCI — percutaneous coronary intervention; CABG — coronary artery bypass grafting

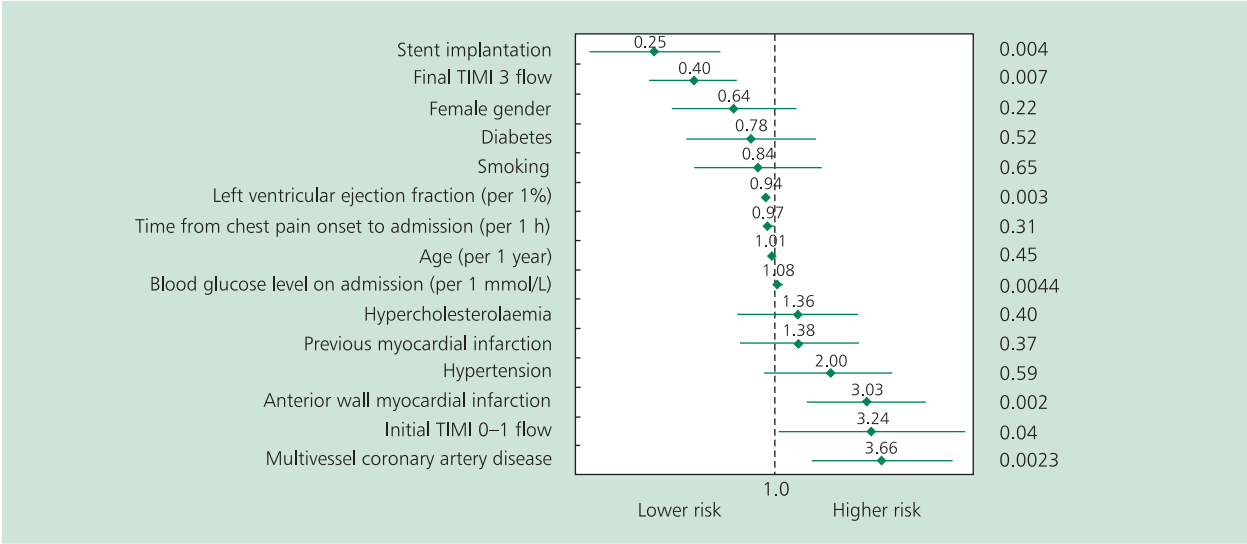

Figure 1. Independent prognostic factors of in-hospital mortality in multivariate analysis

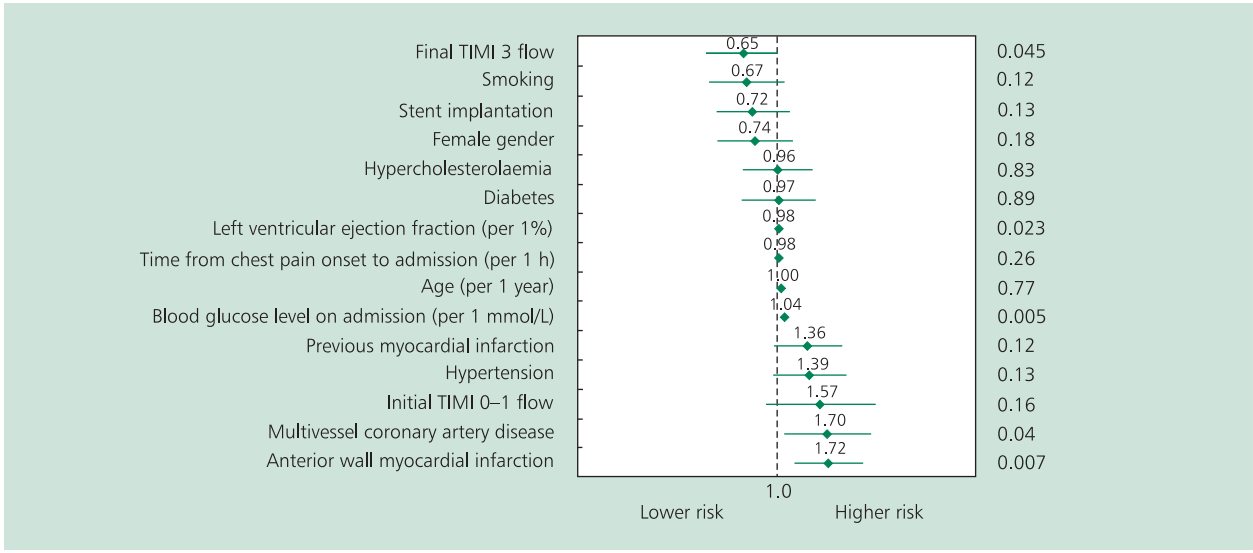

Figure 2. Independent prognostic factors of 1-year mortality in multivariate analysis

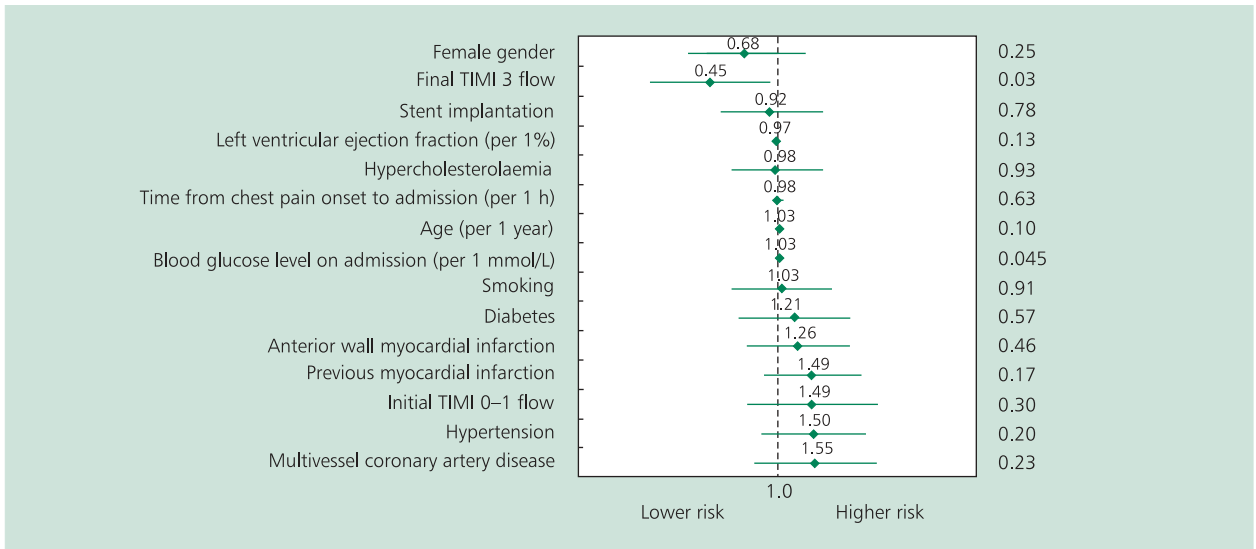

Figure 3. Independent prognostic factors of 5-year mortality in multivariate analysis

of blood glucose level on admission on outcomes in non-diabetic patients with CS. In our study, we analysed the relation between blood glucose level on admission and prognosis in patients with STEMI complicated with CS without excluding diabetic patients. We compared groups with or without hyperglycaemia defined as blood glucose level ≥ 7.8 mmol/L, as this threshold defines abnormal glucose metabolism in OGTT [17]. We showed that patients with hyperglycaemia differed from patients without hyperglycaemia in regard to age and the rates of hypertension, diabetes, and smoking. Similar differences were also noted in studies that were not limited to patients with CS [2, 4]. We found a lower rate of postprocedural TIMI 3 flow in the infarct-related artery in patients with higher blood glucose level on admission. Similar findings were reported by Vis et al. [16] in non-diabetic patients. In their study, the rate of TIMI 3 flow after PCI was 82.5%, 81.7% and 46.3% in patients with blood glucose level on admission of < 7.8, 7.8–11.0, and > 11.0 mmol/L, respectively. In contrast, glucose levels measured in a MI patient population that was not limited to patients with CS did

not affect the rate of postprocedural TIMI 3 flow in the infarct-related artery [2, 8, 18]. Of note, in our patients with MI complicated with CS, the rate of postprocedural TIMI 3 flow was similar in patients with and without diabetes. Overall, the rate of stenting in patients with CS was about 70%. It should be emphasised that our analysis included patients hospitalised in 1998–2006, with initially limited availability of stents. In addition, the effectiveness of angioplasty in patients with CS is reduced compared to patients without CS [12]. Lack of postprocedural TIMI 1–2 flow after balloon angioplasty was associated with inability to implant a stent.

The most important implication of the present analysis is that we demonstrated a relationship between glycaemia on admission and in-hospital and long-term mortality in patients with STEMI complicated with CS. Mortality was about 1.5 times higher in patients with higher blood glucose level on admission. Multivariate analysis showed that each increase in glycaemia on admission by 1 mmol/L was related to an increase in in-hospital, 1-year, and 5-year mortality by 8%, 4% and 3%, respectively. We also showed significantly shorter duration of hospitalisation in patients with hyperglycaemia, resulting from more deaths among these patients during the first days after admission.

It seems that the relation between higher blood glucose level on admission and increased mortality may result from mechanisms that are described below. Hyperglycaemia in the acute phase of MI reflects a relative insulin deficiency that is associated with lipolysis stimulation, leading to increased blood levels of free fatty acids [19, 20]. Free fatty acids exert toxic effects on cardiomyocytes, leading to cell membrane damage, arrhythmogenesis, increased myocardial oxygen requirement and impaired myocardial contractility [21, 22]. In addition, hyperglycaemia increase myocyte apoptosis and activates proinflammatory cytokines, leading to further cardiomyocyte damage [23, 24]. These processes are reflected by higher levels of cardiac necrosis markers and lower LVEF in patients with higher glucose levels [5, 8]. Hyperglycaemia also leads to increased endothelial dysfunction, hypercoagulability and impaired fibrinolysis [25, 26].

Glycaemia on admission was found to be related to the occurrence of the no-reflow phenomenon. Ishihara et al. [27] reported much higher rates of no-reflow in patients with hyperglycaemia (> 11.0 mmol/L) in the acute phase of MI. This association was shown in both diabetic and non-diabetic patients. In addition, glycaemia on admission was found to be an independent prognostic factor that increased the risk of the no-reflow phenomenon [7]. This observation is particularly important, as the no-reflow phenomenon is an independent predictor of higher mortality in MI [28, 29]. The relation between glycaemia on admission and mortality among patients with CS that was found in our study cannot be easily interpreted in the context of results reported by other investigators due to a limited number of studies that dealt with this issue. Valente et al. [30] showed higher blood glucose level after admission in patients who died in hospital compared to survivors. In an univariate analysis, glucose level > 200 mg/dL was an independent predictor of in-hospital mortality but this association was not confirmed in multivariate analysis. Tada et al. [31] evaluated patients with CS, including 72.7% with an acute coronary syndrome. Higher blood glucose level on admission was associated with higher in-hospital mortality both in the overall study population and in patients with an acute coronary syndrome. In addition, glycaemia ≥ 9.2 mmol/L was an independent predictor of mortality in multivariate analysis. Vis et al. [16] showed that blood glucose level on admission determined higher 30-day and 1-year mortality in non-diabetic patients in shock. In multivariate analysis, the OR of 1-year mortality per each increase in blood glucose level by 1 mmol/L was 1.155 (95% CI 1.070–1.247).

In summary, the relationship between glycaemia on admission and mortality in patients with CS that was found in our study suggests that impaired glucose metabolism may, among other factors, have important prognostic implications in patients with STEMI complicated with CS. This association seems to be particularly important due to a limited number of proven predictors of mortality in these patients.

CONCLUSIONS

Higher blood glucose level on admission, regardless of the diagnosis of diabetes, results in higher in-hospital and long-term mortality in patients with STEMI complicated by CS and treated with PCI.

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Stężenie glukozy przy przyjęciu determinuje śmiertelność wewnątrzszpitalną i odległą chorych ze STEMI powikłanym wstrząsem kardiogennym leczonych przezskórną interwencją wieńcową

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Streszczenie

Wstęp: Stężenie glukozy w ostrej fazie zawału serca wpływa na śmiertelność wewnątrzszpitalną i odległą chorych. Wstrząs kardiogenny (CS) istotnie pogarsza rokowanie pacjentów z zawałem serca. Istnieją nieliczne i niejednoznaczne doniesienia na temat wpływu stężenia glukozy przy przyjęciu na śmiertelność chorych z zawałem serca powikłanym CS.

Cel: Celem pracy było określenie zależności między stężeniem glukozy przy przyjęciu a śmiertelnością wewnątrzszpitalną i odległą pacjentów z zawałem serca z uniesieniem odcinka ST (STEMI) powikłanym CS, leczonych przezskórną interwencją wieńcową (PCI).

Metody: Analizie poddano kolejnych chorych ze STEMI powikłanym CS leczonych za pomocą PCI w latach 1998–2006, u których dostępne były dane na temat stężenia glukozy przy przyjęciu. Glikemię oznaczano w chwili przyjęcia do szpitala, na izbie przyjęć. Na potrzeby niniejszej analizy chorych podzielono na dwie grupy w zależności od wartości glikemii przy przyjęciu, bez względu na obecność cukrzycy. Grupę pierwszą stanowili chorzy ze stężeniem glukozy przy przyjęciu $< 7,8$ mmol/l, a grupę drugą — pacjenci z glikemią $\geq 7,8$ mmol/l. Pierwotnym punktem końcowym była śmiertelność: wewnątrzszpitalna, 1-roczna i 5-letnia. Związek między stężeniem glukozy przy przyjęciu a śmiertelnością analizowano we wcześniej zdefiniowanych grupach. Ze względu na możliwą liniową zależność pomiędzy śmiertelnością a glikemią stężenie glukozy przy przyjęciu w analizie wieloczynnikowej zostało użyte jako parametr ciągły.

Wyniki: Spośród 3166 kolejnych chorych ze STEMI leczonych PCI wyodrębniono 312 (8,9%) osób z CS. Ostatecznie do analizy włączono 258 pacjentów, w przypadku których była znana wartość glikemii przy przyjęciu. W grupie pierwszej, z niższym stężeniem glukozy przy przyjęciu, było 75 chorych (15 z cukrzycą), a w grupie drugiej, z wyższym stężeniem glukozy — 183 osoby (64 z cukrzycą). Pacjenci z wyższym stężeniem glukozy przy przyjęciu rzadziej palili tytoń, częściej występowała u nich cukrzyca w porównaniu z chorymi z glikemią $< 7,8$ mmol/l. Stwierdzono także tendencję w kierunku starszego wieku i częstszego występowania nadciśnienia tętniczego w tej grupie chorych. Ponadto u osób z hiperglikemią zaobserwowano istotnie niższy odsetek końcowego przepływu TIMI 3 w tętnicy dozawałowej. Śmiertelność wewnątrzszpitalna, 1-roczna i 5-letnia w całej grupie chorych ze STEMI powikłanym CS wynosiła odpowiednio 37,6%, 46,5% i 59,4%. U chorych ze stężeniem glukozy przy przyjęciu $\geq 7,8$ mmol/l stwierdzono istotnie wyższą śmiertelność wewnątrzszpitalną w porównaniu z pacjentami z glikemią $< 7,8$ mmol/l (41,5% *v.* 28,0%). Podobna zależność utrzymała się w obserwacji odległej. Śmiertelność 1-roczna wynosiła 51,4% i 34,7%, a 5-letnia 65,8% i 43,3%, odpowiednio dla chorych ze stężeniem glukozy $\geq 7,8$ mmol/l i $< 7,8$ mmol/l. W analizie wieloczynnikowej wykazano, że stężenie glukozy przy przyjęciu (na każdy wzrost o 1 mmol/l) jest niezależnym czynnikiem wyższej śmiertelności wewnątrzszpitalnej (OR 1,08; 95% CI 1,02–1,14; $p = 0,0044$), 1-rocznej (HR 1,04; 95% CI 1,01–1,06; $p = 0,005$) i 5-letniej (HR 1,03; 95% CI 1,01–1,05; $p = 0,045$). Istotne jest, że cukrzyca nie wpływa na śmiertelność wewnątrzszpitalną (OR 0,78; 95% CI 0,37–1,67; $p = 0,52$], 1-roczną (HR 0,97; 95% CI 0,64–1,49; $p = 0,89$) i 5-letnią (HR 1,21; 95% CI 0,63–2,31; $p = 0,57$).

Wnioski: Wyższe stężenie glukozy przy przyjęciu, bez względu na obecność cukrzycy, determinuje większą śmiertelność wewnątrzszpitalną i odległą u chorych ze STEMI powikłanym CS leczonych za pomocą PCI.

Słowa kluczowe: hiperglikemia, zawał serca, wstrząs kardiogenny

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