The blood pressure returned to hypertensive values only three weeks after recovery of an intact renin angiotensin system. This is surprising even though it is known that continuous control of blood pressure can be achieved despite intermittent resumption of normal angiotensin converting enzyme activity.⁵

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Prognostic importance of hyperglycaemia induced by stress after acute myocardial infarction

Transient hyperglycaemia is a recognised finding during acute myocardial infarction and is considered to be related to stress. On clinical signs alone hyperglycaemia induced by stress cannot be differentiated from undiagnosed diabetes mellitus. In this study we measured haemoglobin A_1 concentrations to differentiate between the two conditions. Hyperglycaemia induced by stress in acute myocardial infarction was then related to prognosis using the coronary risk index of Peel *et al*¹ (a prognostic index for grading the severity of infarction based on sex, age, ischaemic history, shock, heart failure, and electrocardiographic changes; a score of ≥ 17 is associated with a 50% risk of death).

Patients, methods, and results

We studied 110 patients admitted to hospital with suspected acute myocardial infarction. They were examined on admission and note made of pulse rate, blood pressure, cardiac rhythm, and the presence or absence of shock or cardiac failure. The examination was repeated on days 1, 2, and 10 after admission. Blood glucose concentrations were measured on admission and after fasting on days 1 to 5. Haemoglobin A₁ concentrations were measured on days 1 and 3. All patients who had hyperglycaemia and survived, other than those known to have diabetes, were reviewed three months later, when haemoglobin A₁ concentrations were measured. Glucose tolerance tests were also performed at that time by measuring blood glucose concentrations on fasting and one and two hours after ingestion of 75 g glucose.

In the assay of haemoglobin A_1 concentrations red cells were diluted in a ratio of 1:10 with physiological saline and incubated overnight before formation of the haemolysate. The assay was then performed using a Biorad column test kit (catalogue No 191-7001). Blood samples taken from 40 healthy laboratory staff two hours after a meal gave a normal range of 4.5-7%; in all samples the glucose concentrations were lower than 7.3 mmol/l (132 mg/ 100 ml).

Acute myocardial infarction, defined according to criteria of the World Health Organisation,² was confirmed in 61 patients, 21 of whom (34%) had hyperglycaemia compared with four of the 49 (8%) without acute myocardial infarction ($\chi^2=9\cdot2$; df=1; p<0.01) (figure). Only one patient with

acute myocardial infarction had a raised haemoglobin A₁ concentration (11%) and died during the acute phase. Fourteen patients died during admission and a further four during the follow up, giving a total death rate of 30%. Hyperglycaemia was then related to prognosis using the Peel index. The death rates after acute myocardial infarction were 57% (12/21) in patients with hyperglycaemia induced by stress and 15% (6/40) in those without (χ^2 = 9-8; df=1; p<0.01). A Peel index of >17 was found in 17 out of 21 patients (80%) with and six out of 40 patients (15%) without hyperglycaemia (χ^2 = 22.8; df=1; p<0.001). A mong 49 patients who did not suffer acute myocardial infarction four had hyperglycaemia induced by stress; all four presented with acute left ventricular failure. One died during follow up. Ultimately haemoglobin A₁ concentrations were measured and glucose tolerance tested in 12 patients who had hyperglycaemia induced by stress and survived. The results of both tests were normal in 10 patients and indicative of diabetes in two, one of whom had a haemoglobin A₁ concentration of 7.7%.



Haemoglobin A_1 and blood glucose concentrations in patients on admission with and without acute myocardial infarction (AMI). Patients with Peel index ≥ 17 are compared with those with Peel index < 17 ($\chi^2 = 9\cdot 2$; df=1; $p < 0\cdot 01$). Horizontal lines indicate upper limit of normal glucose concentration and normal range of haemoglobin A_1 concentration. The four patients without AMI whose blood glucose concentrations were above the normal range had left ventricular failure.

Conversion: SI to traditional units-Glucose: 1 mmol/l ≈ 18 mg/100 ml.

Comment

Our study showed that hyperglycaemia is common after acute myocardial infarction whereas high haemoglobin A_1 concentrations are less common. Accordingly, routine measurement of haemoglobin A_1 concentrations in patients thought to have hyperglycaemia induced by stress is unlikely to be helpful despite a previous suggestion that it is of value for early interpretation of hyperglycaemia after acute myocardial infarction.³ We also showed that hyperglycaemia induced by stress is associated with poor prognosis in patients who have had acute myocardial infarction. Follow up of such patients suggested that hyperglycaemia induced by stress is a temporary phenomenon in patients with otherwise normal carbohydrate tolerance, contrary to previous findings.⁴ We conclude that hyperglycaemia induced by stress should be considered to be a crude prognostic marker in acute myocardial infarction indicating poor prognosis and high mortality.

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