Hypoglycemia during Hemodialysis in Diabetics Treated with Insulin

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Dear Sir,

Hypoglycemia is a potentially lethal complication of renal failure and dialysis [1-4]. Hemodialysis against a bath containing no glucose may aggravate this complication. Certain other features of the patients, such as insulin injections and glycemic control, could also potentially affect dialysis-induced hypoglycemia. We compared 16 diabetic patients who had frequent (in more than 25% of the measurements) hypoglycemia (blood glucose < 3.3 mmol/l) during or immediately after hemodialysis (group A) to another 16 diabetic patients who had infrequent (in less than 10% of the measurements) hypoglycemia during or immediately after hemodialysis (group B). Only 1 patient in group B was a woman. Hemodialysis was performed against a bath containing acetate as a substrate for bicarbonate and no glucose. All patients were receiving insulin throughout the dialysis period. No subject received drugs associated with hypoglycemia in dialysis patients, such as β -adrenergic blocking agents or aspirin. Blood glycosylated hemoglobin was measured by a method suitable for dialysis patients [5]. Statistical comparison was carried out by the two-tailed Student's t test for continuous variables and by the χ^2 test for categorical variables.

Table 1 shows the comparison of the two groups. All parameters of glycemic control were statistically worse in group A than in group B. Furthermore, whereas in group A hypoglycemia was more frequent during dialysis than in routine predialysis measurements ($p < 0.001$), its frequency did not differ between blood samples obtained during or immediately after dialysis and those obtained

before dialysis in group B. In group A, hypoglycemia was symptomatic during dialysis in more than 60% of the instances requiring glucose infusion. In contrast, in group B hypoglycemia was usually not severe and asymptomatic, and was discovered in the course of routine postdialysis blood measurements. A consequence of this difference between groups A and B was that the frequency of blood glucose determinations during or immediately after dialysis was 4 times higher in group A than in group B. Deaths from hypoglycemia during or immediately after dialysis were not noted in either group.

The development of hypoglycemia during hemodialysis was probably facilitated by the absence of glucose in the bath, with consequent net loss of blood glucose into the dialysate, and by the presence of acetate in the bath. Acetate inhibits the release of an insulin-counterregulatory hormone [6]. During the last 2 years, we have been routinely dialyzing diabetics against a bath containing bicarbonate and glucose in a concentration of 11.1 mmol/l. Although the diabetics currently dialyzed by this regime are different from those included in groups A and B, the

incidence of symptomatic hypoglycemia has been very low in the past 2 years, even in diabetics with poor glycemic control, who exhibit at times predialysis hypoglycemia. Diabetics receiving insulin, who have poor glycemic control, are prone to severe hypoglycemia during hemodialysis. It appears that the use of a dialysate containing bicarbonate and glucose prevents to a great extent this dialysis-induced hypoglycemia.

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0028-2766/92/

0614-0470\$2.75/0

Table 1. Demographic parameters and glycemic control

Results on the first line are the range, on the second line, the mean $\pm$ SD.

IDDM = Insulin-dependent diabetes mellitus; NIDDM = non-insulin-dependent diabetes mellitus.

a Routine predialysis blood values. b Routine predialysis blood glucose levels > 11.1 mmol/l. c Routine predialysis blood glucose levels < 3.3 mmol/l. d Blood glucose levels < 3.3 mmol/l during or immediately after hemodialysis.

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