Negative Correlation between Fasting Plasma Insulin and Ambulatory Blood Pressure in Patients on Chronic Hemodialysis

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Dear Sir,

The excellent review presented by Mak and De Fronzo [1] on glucose and insulin metabolism in uremia suggested a hypertensive effect of hyperinsulinemia in chronic renal failure. Insulin resistance is universal in patients with moderate to severe renal insufficiency. The defects in insulin-mediated glucose disposal and the resultant impairment in glucose tolerance and hyperinsulinemia may well be responsible for the accelerated atherosclerosis and an increased incidence of hypertension which are well documented in uremic individuals [2]. There has been much interest in the involvement of insulin in the mechanisms responsible for hypertension. Positive correlation between blood pressure and insulin is well established in patients with essential hypertension as well as in normotensive subjects [3].

We have examined the relationship between ambulatory blood pressure and fasting plasma insulin level in chronic renal failure. The study group consisted of 14 nondiabetic patients (8 females, 6 males, mean age 39 ± 12 years) on chronic hemodialysis (mean 2.5 years), dialyzed 3 times a week. The mean creatinine concentration was $919 \pm 169 \mu\text{mol/l}$ and hematocrit $24.8 \pm 3.0\%$. No subject had any major system disease other than kidney failure. Noninvasive 24-hour ambulatory blood pressure (ABP) and heart rate (HR) monitoring was performed with a Spacelabs 5300 device. Mean 24-hour systolic blood pressure was 146.7 ± 16.8 mm Hg and mean 24-hour diastolic blood pressure was 93.0 ± 11.1 mm Hg. Plasma concentration of

200

$\sigma >$

X

ε

180 160

sz

CM

140

SBP

120

100

0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.20 log Ins mU/l

immunoreactive insulin was measured by radioimmunoassay. The logarithms of insulin were used in the analysis to normalize distribution. Relations between variables were analyzed by simple correlation.

Most studies have shown that the fasting and glucose-stimulated plasma insulin concentrations are increased in uremic subjects [4, 5]. In our study group, the mean fasting insulin concentration was 43.9 ± 34.9 mU/l (315 ± 250 pmol/l) and the fasting glucose level 4.72 ± 0.67 mmol/l.

Standard immunoassay was used for the determination of plasma insulin, and we have no data on insulin precursors and their importance. Sur-

prisingly, fasting plasma insulin was found to be significantly negatively correlated with 24-hour systolic ($r = -0.80$, $p < 0.001$) and dia-stolic ($r = -0.55$, $p < 0.05$) ABP on the day of hemodialysis (fig. 1). A negative correlation of similar magnitude was found when the awake and asleep ABP values were taken into account.

Our results indicate a hypotensive effect of the increased level of insulin in hemodialysed patients with chronic renal failure. It has been shown in several studies that insulin may increase peripheral blood flow and thus contribute to the hypotensive effect of insulin [6, 7]. The correlation between insulin and

blood pressure described above obviously does not demonstrate that the relation is causal. It has been hypothesized that insulin elevates arterial pressure through its sympatho-excitatory and antinatriuretic effects [8]. The lack of the antinatriuretic effect and uremic autonomic neuropathy could reveal the vasodilatory action of insulin in patients with chronic renal failure. This could explain the significant negative correlation between 24-hours ABP and the fasting insulinemia found in our study.

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494

Winnicki/Rynkiewicz/Narkiewicz/Bullo/ Relationship between Plasma Insulin
and Lichodziejewska/Rutkowski/Manitius ABP in Chronic Renal Failure