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The Relationship Between Kidney Size and Function in Short-Term Diabetic Patients

Dear Sir,

In a recent Letter to the Editor, Gundersen and Mogensen [1] presented a statistical evaluation of the available data from studies of glomerular filtration rate (GFR), renal plasma flow and kidney size in short-term Type 1 (insulin-dependent) diabetic patients. Their analysis led them to suggest that the major – perhaps even the sole – determinant of the increased GFR in short-term Type 1 diabetic patients is the increased kidney size. This suggestion may well be valid in clinically so-called well controlled diabetic patients, but it is certainly not so in poorly controlled subjects. Previous studies in poorly controlled Type 1 diabetic patients have demonstrated a 20% reduction in GFR during 1–2 weeks of improved metabolic control [2, 3]. Recently, we studied GFR and kidney size (by ultrasound) in newly diagnosed Type 1 diabetic patients without ketoacidosis, before and after 8 days of strict metabolic control [4]. GFR was elevated by 44% before insulin treatment and remained 20% above normal after 8 days of strict metabolic control. The size of the enlarged kidney remained unchanged after 8 days of strict metabolic control. These data suggest that the elevation of GFR in poorly controlled Type 1 diabetic patients consists of two parts: rapid and slow reversible components of approximately the same order of magnitude. The rapidly reversible part can hardly be explained by morphological changes alone since kidney *size* was unchanged. Furthermore, the demonstrated increase in the glomerular filtration surface area (partly constituting one of the three well-known determinants of GFR) in newly diagnosed Type 1 diabetic patients also remains unaltered after 3 months of insulin treatment [5], a time by which a substantial decline in GFR would be expected.

It is documented that GFR in Type 1 diabetic patients can be increased or decreased within minutes in response to physiological changes in plasma levels of insulin, glucose and glucagon [6–10]. It is extremely unlikely that changes in kidney size can account for these rapid changes in GFR.

Studies in poorly controlled insulin-treated streptozotocin diabetic rats have shown that the elevated GFR is due to increased renal plasma flow, raised transglomerular filtration pressure, and probably also enlarged ultrafiltration coefficient (i.e. the product of the glomerular water permeability and the surface area available for filtration) [11, 12].

We conclude that the elevation of GFR in poorly controlled Type 1 diabetic patients consists of both rapid and slow reversible components. The rapidly reversible part, accounting for approximately half of the elevation, cannot be explained by the demonstrated enlargement of the kidney or of the glomerular surface area, but is due to an increase in the remaining two GFR determinants: renal plasma flow and transglomerular pressure. We agree with Gundersen and Mogensen that the slowly reversible part of the GFR elevation is probably due to enlargement of the kidney.

Yours sincerely,
J. Sandahl Christiansen and H.-H. Parving

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Dr J. Sandahl Christiansen
Steno Memorial Hospital
DK-2820 Gentofte, Denmark

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Insulin Aggregation and the Use of Infusion Pumps

Dear Sir,

A recent article in Diabetologia [1] recommended the use of a phosphate buffered (ph 7.0) highly purified insulin preparation in conjunction with EDTA treatment of the reservoir and tubing (to minimize metal ion contamination of the delivery system) in order to avoid the problem of insulin aggregation in artificial infusion devices. An earlier study [2] had shown that the ability of physiological fluids in vitro to dissolve crystals of insulin at a normal pH was dependent on the bicarbonate content. I wish to report a practical application of this latter observation to the problem of insulin aggregation in insulin infusion devices.