ages or weights. Mean ± SD fasting plasma glucose did not differ between groups (−4.59 ± 0.28 mM in the OCA group vs. 4.65 ± 0.40 mM in the control group). All were within the normal range. There was no correlation between fasting plasma glucose and fructosamine in either group. Mean serum fructosamine levels were 2.22 ± 0.12 mM (range 2.02–2.41 mM) in the OCA group compared to 2.06 ± 0.11 mM (1.85–2.20 mM) in the control group, which shows a significantly greater level in the former ($P < 0.01$).

The National Health and Nutrition Examination Survey 1976–1980 conducted by the National Center for Health Statistics in women 20–44 yr old has shown decreased glucose tolerance in 15.4% of OCA users compared with 6.3% in nonusers (2). The question of whether OCAs may precipitate permanent diabetes in susceptible women is not resolved, but it has been suggested that they are unlikely to do so through the mechanism of sustained blood glucose elevation (3). However, women with a history of gestational diabetes show deterioration in glucose tolerance after each birth and after OCA use (4).

In our study, involving a small number of subjects, serum fructosamine, although within the normal range, was significantly increased in the OCA users. Although fasting plasma glucose levels did not differ between groups, the increased fructosamine levels in the OCA users might cause suspicion of some subtle change in glucose metabolism in this group. Because serum fructosamine measurement is a simple and inexpensive procedure, periodic monitoring of this parameter before and during OCA use might prove worthwhile, particularly in those women who for various reasons are at risk of developing diabetes.

TERESA H. MITCHELL, MD
MARGARET O'BRIEN, SRN
LESLIE F. HARLING, FIMLS
CHARLES S. PATERSON, HND

From Beecham Pharmaceuticals Research Division, Epsom, Surrey, United Kingdom.

Address correspondence and reprint requests to Teresa H. Mitchell, MD, Beecham Pharmaceuticals Research Division, Great Burgh, Yew Tree Bottom Road, Epsom, Surrey, KT18 5XQ UK.

REFERENCES

1. Hindle EJ, Rostron GM, Gatt JA: The estimation of serum fructosamine: an alternative measurement to glycated haemoglobin. *Ann Clin Biochem* 22:84–89, 1985
2. Russell-Briefel R, Ezzati TM, Perlman P, Murphy RS: Impaired glucose tolerance in women using oral contraceptives: United States 1976–1980. *J Chronic Dis* 40:3–11, 1987
3. Oakley N, Rostron W: Effect of combined oral contraceptives on glycosylated haemoglobin. *J R Soc Med* 75:234–36, 1982
4. Perlman JA: *Proc Workshop Oral Contraceptives and Carbohydrate Metabolism, Chicago, IL, 1982*

Measurement by Single Injection of Polyfructosan of Glomerular Filtration Rate in Young Diabetic Patients

Approximately 35% of diabetic children show increased glomerular filtration rate (GFR) after a few years of diabetes (1,2). Such abnormality may be associated with glomerular damage in both diabetic animals (3,4) and humans (5). Inulin clearance with sustained infusion during forced water diuresis or bladder catheterization may not be well accepted by patients (6). Although simpler, measurement of endogenous creatinine clearance is not accurate enough (7). The plasma disappearance rate of ^{51}Cr-EDTA after a single bolus injection has been demonstrated to be almost equivalent to inulin clearance in measuring GFR (8). We evaluated whether the administration of polyfructosan (Inutest, Laevosan-Gesellschaft, Linz, Austria; 9) by the single intravenous bolus technique was as satisfactory as ^{51}Cr-EDTA in measuring GFR in insulin-dependent diabetic (IDDM) children and adolescents.

Polyfructosan is an inulinlike molecule that is filtered through the renal glomeruli but is neither reabsorbed nor secreted by the tubuli; unlike inulin, polyfructosan is water soluble at room temperature at any concentration. Twenty-one children and adolescents with IDDM (12 males, 9 females) were studied after informed consent was given. Mean age was 18.2 yr (range 13–25 yr), and mean duration of diabetes was 9.3 yr (range 6–19 yr). No patients had clinical proteinuria. The tests were performed on the first morning. Twenty milliliters of 25% Inutest was injected in an antecubital vein in 30 s. Meanwhile, in the contralateral arm, 1 μCi ^{51}Cr-EDTA/kg body wt was given as a single injection midway during the polyfructosan injection. Venous blood samples were drawn at 5, 15, 30, 45, 60, 75, 90, 120, 150, and 190 min for serum polyfructosan and 5, 15, 30, 60, 190, and 315 min for plasma ^{51}Cr-EDTA (8). Polyfructosan concentration was measured according to the method of Heyrovsky (10), and glucose was measured by glucose oxidase. Interference of glucose level on polyfructosan assay was evaluated by adding increasing amounts of glucose to polyfructosan at known concentrations. Statistical analysis was performed by a commercially available package (MINITAB, Pennsylvania State University), and all results are expressed as means ± SD. Regression between variables was calculated by Pearson's test.

Mean GFR with polyfructosan was 122.8 ± 14.9 ml · min^{-1} · 1.73 m^{-2}, whereas with ^{51}Cr-EDTA, mean GFR was 116.8 ± 14.6 ml · min^{-1} · 1.73 m^{-2}. The mean difference between the two simultaneously obtained values of GFR was 6.5 ± 5.5 ml · min^{-1} · 1.73 m^{-2}. A significant correlation was observed between the two clearances. The regression equation was ^{51}Cr-EDTA = 4.8 + 0.912 polyfructosan ($r = 0.930$, $P <$

0.001). The glycemic level was 10.9 ± 5.1 mM at baseline and 10.1 ± 4.3 mM during the clearance. Glycemic excursion between the points of the polyfructosan clearances was 0.97 ± 0.86 mM. Interference of glucose in vitro on inulinlike-polyfructosan assay was 3, 5, and 6% at glucose concentrations of 7.8, 13.1, and 19.9 mM, respectively. The intra-assay coefficient of variation of polyfructosan was <4.5%. Eighty percent of the GFR values obtained by polyfructosan were 5% higher than the values obtained by ^{51}Cr-EDTA. This difference between the two simultaneous clearances may be due to the interference of blood glucose on polyfructosan measurement or to the shorter period of observation with the polyfructosan clearances. Indeed, there was no correlation between the degree of hyperglycemia and the observed overestimation of GFR by polyfructosan clearance. Moreover, adding a 6% interference at each point of a classic disappearance curve (as in the presence of a steady glycemia of 13.9 mM), the final GFR did not change. Preventing glycemia excursion >5 mM between the points of clearance, variations of glycemia interference can be diminished below inulin intra-assay level. GFRs calculated with ^{51}Cr-EDTA at 190 min are ~10% greater than GFRs calculated with the clearance at 315 min due to the incomplete equilibration of the tracer (128.8 ± 13 vs. 116.8 ± 14.6 ml · min^{-1} · 1.73 m^{-2}). The shorter observation period of polyfructosan (due to technical difficulties of detecting low inulin concentrations at 315 min) may be similarly responsible for the overestimation versus the 315-min clearances with ^{51}Cr-EDTA.

We suggest that the use of any substance by single-injection technique may be interchangeable in diabetic patients with normal or elevated GFR, even if 5% overestimation is observed by two-compartment analysis of polyfructosan-decay curves. Inulinlike polyfructosan, a nonradioactive tracer, should be considered when frequent GFR evaluations are necessary, as in hyperfiltering diabetic patients, or when a nuclear-medicine department is not available. Otherwise, for routine periodic GFR assessment, ^{51}Cr-EDTA should be preferred because radioactive isotopes can be detected easily in body fluids and with greater accuracy.

EMILIO BOGNETTI, MD
LUIGI GIANOLLI, MD
MARIA CARLA PROVERBIO
MARIA PUZZOVIO
FRANCO MESCHI, MD
PAOLO GERUNDINI, MD
GIUSEPPE CHIUMELLO, MD

From the Pediatric Department and Endocrine Unit and the Nuclear Medicine Department, Scientific Institute San Raffaele, University of Milan, Milan, Italy.
Address correspondence and reprint requests to Dr. Emilio Bognetti, H. San Raffaele, Clinica Pediatrica III, Via Olgettina 60, 20132 Milan, Italy.

ACKNOWLEDGMENTS

This study was partly supported by Consiglio Nazionale Pelle Ricerche Grant CT-84.00813.04.115.04706, Italy.

We acknowledge Drs. Flaviano Dosio and Lorenzo Maffioli for cooperation with the study and Anna Baiocchi for secretarial assistance.

REFERENCES

1. Wiseman MJ, Viberti GC, Keen H: Threshold effect of plasma glucose in the glomerular hyperfiltration of diabetes. *Nephron* 38:257–60, 1984
2. Mogensen CE, Steffes MW, Deckert T, Sandahl Christiansen J: Functional and morphological renal manifestations in diabetes mellitus. *Diabetologia* 21:89–93, 1981
3. Zazt R, Dunn R, Timothy WM, Anderson S, Rennke HG, Brenner BM, Troy JL, Graphenried RL, Noddin JL, Nunn AW, Sandstrom D: Prevention of diabetic glomerulopathy by pharmacological amelioration of glomerular capillary hypertension. *J Clin Invest* 77:1925–30, 1986
4. Hostetter TH, Rennke HG, Brenner BM: The case for intrarenal hypertension in the initiation and progression of diabetic and other glomerulopathies. *Am J Med* 72:375–80, 1982
5. Mogensen CE, Christensen CK: Predicting diabetic nephropathy in insulin-dependent patients. *N Engl J Med* 311:89–93, 1984
6. Shannon JA, Smith HW: The excretion of inulin, xylose and urea by normal and phlorhizinized man. *J Clin Invest* 14:393–97, 1935
7. Doolan PD, Alpen EL, Theil GB: A clinical appraisal of the plasma concentration and endogenous clearance of creatinine. *Am J Med* 32:65–70, 1962
8. Broechner-Mortensen J: A simple method for the determination of glomerular filtration rate. *Scand J Clin Lab Invest* 30:271–74, 1972
9. Nitsch E: Molecular characterization of sinistrin. *Carbohydr Res* 72:1–12, 1979
10. Heyvrosky A: A new method for the determination of inulin in plasma and urine. *Clin Chim Acta* 1:470–74, 1956

Brain Wave on the Witness Stand

An idea came to me recently while I was on the witness stand. As diabetologists are called to do from time to time, I was giving my opinion as to whether hypoglycemia could have been to blame for an unusual act: in this case, an episode of presumed shoplifting. As I sat through the trial, I heard how the accused had spent time wandering back and forth through racks of clothing and transferring his groceries in and out of a gym bag in which he had his diabetes supplies and glucometer. The lawyer for the defense asked me if the behavior could in fact have been due to confusion because of hypoglycemia. I had to say that it was a distinct possibility. The prosecutor then asked me, if that had been the case, why had the accused not been sweating or shaking, and why had he been able to argue coherently with the security guard who arrested him? It was then that I had my brain wave.

I reasoned that the accused was on intensive insulin therapy. It is well recognized that, in diabetic patients under these conditions, the warning symptoms of hypoglycemia are sometimes lost (1). However, it is known that stimuli to epinephrine release can be selectively lost; i.e., secretion of epinephrine in response to a stim-