Clinical Evaluation of a Test for Immediate and Quantitative Determination of Urinary Albumin-to-Creatinine Ratio

A brief report

PER LØGSTRUP POULSEN, MD
CARL E. MOGENSEN, MD

Diabetic nephropathy constitutes the most common single cause of end-stage renal failure in both the U.S. and Europe. Improved glycemic control (1) and antihypertensive treatment (2,3) can postpone and possibly prevent development of nephropathy in diabetic patients with microalbuminuria. To have the maximum effect, these interventions must be instituted very early in the development of diabetic nephropathy. In a recent position statement in this journal (4), screening for microalbuminuria was recommended as an essential part of the everyday treatment of diabetic patients (5). Because screening needs to be a continuous process, development of methods that are both reliable and suitable for patients is important. Reagent strips have the advantage of providing an immediate result, but they provide only semiquantitative results and are subject to possible errors from alternations in urine concentration. All specimens that are positive for microalbuminuria by reagent strips or tablets should be confirmed using more specific methods. The spot urinary albumin-to-creatinine ratio performed using quantitative chemical methodology has been convenient for the patient and superior to reagent strips because the creatinine correction accounts for possible errors in urine concentration. Immediate albumin-to-creatinine assays have not been available until now. We report a clinical evaluation of a new test for immediate and quantitative determination of the urinary albumin-to-creatinine ratio.

The DCA 2000 microalbumin/creatinine assay system detects albumin by an immunoturbidimetric direct antibody-antigen aggregation and measures creatinine colorimetrically using the Benedict-Behre reaction. Results are available in 7 min without sample dilution, reagent preparation, or wet calibration. Specimens from diabetic patients were screened in our outpatient clinic using a dipstick test. Specimens negative for proteinuria (n = 195) were tested blindly by three nurses, and the DCA 2000 results were compared with

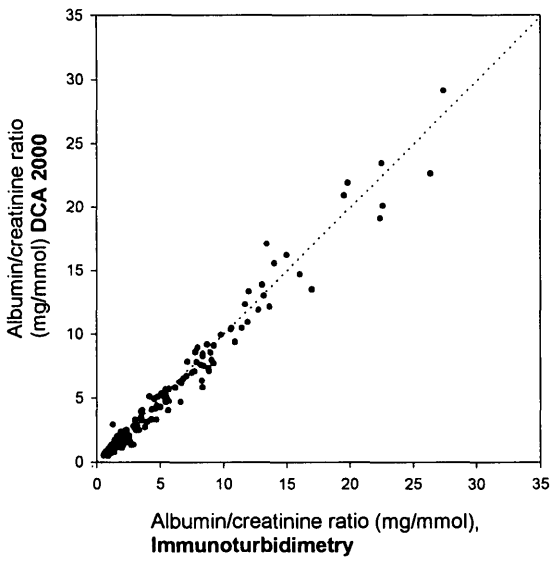

Figure 1—*Albumin-to-creatinine ratios from nonproteinuric diabetic patients tested with DCA 2000 and immunoradiometry* (n = *195*, r = *0.987*, P < 10^{-5}).

Table 1—***Albumin-to-creatinine ratios by routine test and by DCA 2000***

	Albumin-to-creatinine ratio by routine test		
	Normal	Abnormal	Total
Albumin-to-creatinine ratio by DCA 2000			
Normal	114	7	121
Abnormal	2	72	74
Total	116	79	195

Cutoff for abnormal albumin-to-creatinine ratio: 2.5 mg/mmol for males and 3.5 mg/mmol for females.

From the Medical Department M (Diabetes and Endocrinology), Aarhus University Hospital, Aarhus, Denmark.
Address correspondence and reprint requests to Per Løgstrup Poulsen, Department of Medicine M (Diabetes and Endocrinology), Aarhus Kommunehospital, DK 8000 Aarhus C, Denmark. E-mail: logstrup@post4.tele.dk.
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those of our routine method (immunoturbidimetric assay). Of those specimens, 40.5% were classified as positive for microalbuminuria using our routine laboratory method, with cutoff albumin–to–creatinine ratios of 2.5 mg/mmol for males and 3.5 mg/mmol for females (5). Results are depicted in Fig. 1 and Table 1. The sensitivity was 91.1%, specificity 98.3%, predictive value of a positive test 97.3%, and predictive value of a negative test 94.2%. Our data indicate that the DCA 2000 microalbumin/creatinine assay provides an immediate, quantitative, and accurate tool for the detection of microalbuminuria. It complements the DCA 2000 HbA_{1c} assay in the care of diabetes.

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References

1. The Diabetes Control and Complications Trial Research Group: The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med* 329:977–986, 1993
2. The Microalbuminuria Captopril Study Group: Captopril reduces the risk of nephropathy in IDDM patients with microalbuminuria. *Diabetologia* 39:587–593, 1996
3. The Euclid Study Group: Randomised placebo-controlled trial of lisinopril in normotensive patients with insulin-dependent diabetes and normoalbuminuria or microalbuminuria. *Lancet* 349:1787–1792, 1997
4. American Diabetes Association: Diabetic nephropathy (Position Statement). *Diabetes Care* 20 (Suppl. 1): S24–S27, 1997
5. Mogensen CE, Keane WF, Bennett PH, Jerums G, Parving H-H, Passa P, Steffes MW, Striker GE, Viberti GC: Prevention of diabetic renal disease with special reference to microalbuminuria. *Lancet* 346: 1080–1084, 1995