

EVALUATION OF RENAL FUNCTION IN DIABETICS EMPLOYING TWO DIFFERENT METHODS, THEIR COMPARISON AND CORRELATION WITH CLINICAL COURSE

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Summary

27 cases of DM (IDDM 13, NIDDM 14) with 24 hour albumin excretion >250 mg. were studied. 8 cases had GFR > 100 ml/mt, 10 had GFR 50-100 ml/mt and remaining 9 had GFR <50 ml/mt. 24 hour urinary albumin excretion was <1.0 gms, 1.0-2.5 gms, and >2.5 gms in 3 groups and S. creatinine was <1.0 mg%, 1.0-2.5%, >2.5 mg% respectively. One year follow up studies in 5 cases revealed a drop of GFR by 30 ml/mt/year. Proliferative retinopathy in three groups was GFR > 100 ml/mt - Nil, GFR 50-100 ml/mt 2/10 cases and GFR <50 ml/mt-6/9 cases. Large vessel disease in three groups was-GFR > 100 ml/mt Nil, GFR 50-100 ml/mt-3/10 cases and GFR <50 ml/mt 4/9 cases.

Aims and Objectives

1. The aim of the study was to evaluate renal function by endogenous creatinine clearance and compare this with GFR, employing gamma camera using technetium diethylene triamine penta acetate (TC DTPA).
2. To correlate type of diabetes, duration, glycemic control, blood pressure and large vessel disease, serum creatinine and lipids with severity of renal decompensation.
3. To conduct follow up studies on renal function to assess the rate of progression of diabetic renal disease.

Material and Methods

27 cases of diabetes mellitus were selected, going by the criteria of 24 hour urinary albumin excretion >250 mg/24 hours from the Endocrinology wards and out-patient of Endocrinology Unit at All India Institute of Medical Sciences, New Delhi.

There were 18 males and 9 females. 13 patients were IDDM type while 14 were NIDDM type. Mean ages in IDDM - 27.1 years and NIDDM 58.5 yrs. while mean duration of DM was IDDM-7.1 yrs and NIDDM-11.1 yrs. Endogenous creatinine clearance measured by accurately timed collection of 24 hour urine, twice and mean of two values taken.

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Blood sugars were estimated by Nelson Somogyi method.

Glycosylated hemoglobin estimation was done by colorimetric method. GFR Tc DTPA using gamma camera and radioisotope method was based on plasma clearance of injected TC ^{99m} DTPA, determined by serial collection of blood samples.

Results

Routine investigation in two groups, IDDM and NIDDM revealed mean values of Hb A₁C of 12.23% and 11.66% (Table I) respectively, reflecting poor control at the time of inclusion in the study. Lipid profile also revealed raised values in both the groups (Table I). Glomerular filtration rate in the groups was studied and classified into 3 groups as : Group I with GFR > 100 ml/mt, Group II with GFR 50-100 ml/mt, Group III with GFR <50 ml/mt. Total number of cases studied in these groups was 8, 10 and 9 respectively (Table II). A direct correlation between 24 hour urinary albumin, serum creatinine and glomerular filtration was observed (Table III).

Table I
Profile of patients according to type of diabetes

	IDDM (n = 13)	NIDDM (n =14)
Duration of Diabetes (Mean years)	7.1 (3-13)	11.1 (5-20)
Age (Mean years)	27.1 (13-35)	58.5 (40-68)
Hb A ₁ C% (Mean)	12.23 (9-15)	11.66 (8-16.5)
Lipids (Mean)		
S. cholesterol (mg/dl)	236.5 (195-300)	312.8 (210-350)
S. triglycerides (mg/dl)	187.6 (65-250)	215.5 (125-315)

Table II
G F R and Vascular disease profile in different type of diabetes

	I.D.D.M. (n=13)	NIDDM (n=14)
No. of cases		
GFR (mt/mt.)		
1) > 100	5	3
2) 50-100	5	5
3) < 50	3	6
Background retinopathy	5/13 (38.5%)	3/14 (21.5%)
Proliferative retinopathy	2/13 (16.3%)	6/14 (42.8%)
Large Vessel Disease	-	7
Coronary Artery Disease	-	4
Peripheral Vascular Disease	-	3

Incidence of proliferative retinopathy was nil in group I, 20% in group II and 66.6% in group III (Table III). Mild hypertension was present in group III compared to other two groups where BP was normal. Large vessel disease in the form of coronary artery disease and peripheral vascular disease was present in none of Group I, 3/10 in Group II and 4/9 cases in group III.

Table III
Profile according to renal function

Parameter	Group I (n = 8)	Group II (n = 10)	Group III (n = 9)
G.F.R. (ml/mt)	> 100	50-100	< 50
24 Hr. Urinary Albumin	200 mg	1.0-2.5	> 2.5
Serum Creatinine (mg/dl)	1.0	1.0-2.5	> 2.5
B.P (mmHg) (Mean)	116/74	150/92	160/96
Proliferative Retinopathy	Nil	2/10 (20%)	6/9(66.6%)

Discussion

In the present study it was observed that endogenous creatinine clearance if done meticulously gives a fairly accurate measure of GFR. Gamma camera method though more accurate and sensitive is slightly more expensive. In follow up studies upto 1½ years in 5 cases with advanced renal involvement there was rapid decline in GFR (30 ml/year) which is probably 2-3 times as compared to earlier data from West. It was further observed that IDDM group was free of large vessel disease in this sample group of 27 cases. Incidence of small vessel disease is independent of LVD and this may be dependent on racial factors. It is concluded that in assessment of diabetic renal disease advancement, critical criteria for defining advanced renal involvement be S. creatinine >2.5 ml/dl and GFR <50 ml/mt beyond which a nephrologist should intervene and offer a life plan to a diabetic.

References

1. Christiansan, Sen J., Sandahl, Frand Sen, M., Gammelgaard, J. and Parwing, H.H. (1981) : Rapid changes in kidney function-factors influencing kidney function in diabetic and normal man. *Acta Endocrinologica* 97 : 272.

2. Klopper, J.F., Hauser, W., Alkens, H.K. (1972). Evaluation of ^{99m}Tc -DTPA for the measurement of glomerular filtration rate. *JNVC Med.* 13, 107-110.
3. Hall, J.E., Guyton, A.C., Faser, B.M.A. (1977) : Single injection method for measuring GFR. *Am. J. Physiol.* 232, F 72-F 76.
4. Hilson, A.J.W., Mistry, R.D., Maisay, M.M. (1976) : ^{99m}Tc DTPA for measurement of GFR. *Brit J. Radiol.* 49 : 794-796.
5. Gary F. Gates (1982) Glomerular filtration rate : estimation from fractional renal accumulation of ^{99m}Tc DTPA. *Am J. Radiol* 138 : 565.