

Renal functional reserve in children with Type 1 diabetes

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INTRODUCTION

Diabetic nephropathy is a chronic complication of diabetes that is the leading cause of morbidity and mortality among young people with type 1 diabetes mellitus (DM). Early detection of this complication is therefore of great importance. Decrease of renal functional reserve (RFR) may be an early predictive sign of renal nephropathy.

OBJECTIVES

To examine renal functional reserve in children with type 1 DM in order to detect its complications at an early stage of the disease.

RESULTS

Table 1 – Characteristics of patient and control group

Characteristics	Patient group	Control group	p
Number of patients	20	16	ns
Gender (M/F)	10/10	7/9	ns
Age (years)	15.6 ± 2.0	15.1 ± 2.5	ns
Height (cm)	161.4 ± 11.4	165.5 ± 12.0	ns
Weight (kg)	57.8 ± 14.2	60.0 ± 12.4	ns
Duration of DM (years)	7.6 ± 3.3	6.13 ± 3.5	ns
HbA1C (%)	8.8 ± 1.9	8.0 ± 1.2	ns
Serum creatinine (μmol/l)	77.3 ± 16.7	78.9 ± 16.8	ns
Insulin dose (U/kg/day)	1.0 ± 0.3	1.0 ± 0.3	ns
Estimated GFR-eGFR (mL/min/1.73m ²)	117.7 ± 38.7	125.6 ± 13.7	ns

CONCLUSIONS

In our study group, we found that all normoalbuminuric DM1 patients had reduced RFR.

Those results imply that we need to continue to look for new markers of early nephropathy.

METHODS

Renal functional reserve (RFR) is the capacity of the kidney to increase GFR in response to protein meal ingestion. It is the difference between glomerular filtration rate (GFR) measured in basal conditions and GFR measured after a protein meal.

RFR was evaluated and 24 h ambulatory blood pressure monitoring was performed in a group of 20 patients with type 1 DM (10 F/10 M). Control group consisted of 16 patients (7M, 9F) who did not consent to protein meal challenge.

Inclusion criteria:

- duration of DM ≥ 2 years
- Tanner stage of puberty ≥ 2

Exclusion criteria:

previously known microalbuminuria

Estimated glomerular filtration rate (eGFR) was calculated using formula:

$$eGFR (mL/min/1.73m^2) = k \cdot L \cdot sCr$$

k = 0.55 for children and adolescent girls, and 0.7 for boys older than 13 years, L – body length (cm), sCr – serum creatinine (μmol/L)

All the patients were pretreated with cimetidine, and given protein meal made of milk, cheese and eggs. Right before and after protein meal, serum (sCr) creatinine, creatinine clearance (CrCs) and serum cystatin C were measured. RFR was obtained as the difference of CrCs after and CrCs before protein meal consumption:

$$RFR (in mL/min/1.73m^2) = CrCs \text{ after} - CrCs \text{ before protein meal}$$

$$RFR (\%) = (CrCs \text{ after} - CrCs \text{ before protein meal}) \times 100 / \text{before CrCs}$$

All statistical analysis was performed using SPSS.

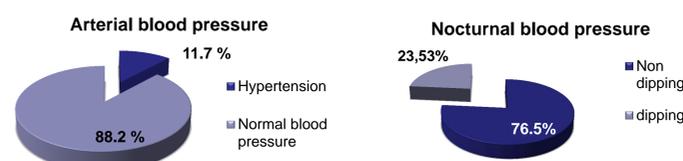
RESULTS

Table 2 – Parameters of renal function before and after protein meal

Renal function estimation	Before protein meal	After protein meal	p
Serum creatinine (μmol/l)	82.0 ± 18.0	83.0 ± 17.8	ns
Creatinine clearance (mL/min/1.73m ²)	109.4 ± 28.7	108.5 ± 26.5	ns
Serum cystatin C (mg/l)	1.0 ± 0.6	0.9 ± 0.4	ns

RFR (in mL/min/1.73m ²)	-0.9 ± 10.4
RFR (%)	-0.1 ± 9.3 %

Graph 1 – Results of 24 h ambulatory blood pressure monitoring



RFR greater than 20% was considered to be normal, but that wasn't found in any of our 20 patients.

References

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