THE IMPACT OF DIETARY FRUCTOSE INTAKE ON MARKERS OF KIDNEY INJURY AND INFLAMMATION IN SUBTOTALLY NEPHRECTOMIZED RATS

Mariusz Flisiński[1], Andrzej Brymora[2], Paweł Stróżecki[1], Anna Stefańska[3] and Jacek Manitius[1]
[1]Department of Nephrology, Hypertension and Internal Diseases, Collegium Medicum of Nicolaus Copernicus University in Bydgoszcz, Poland
[1]Dr. Antoni Jurasz University Hospital No.1 in Bydgoszcz, Poland
[2]Hemodialysis Unit, Nowy Szpital, Świecie, Poland
[3] Department of Clinical Chemistry, Collegium Medicum of Nicolaus Copernicus University in Bydgoszcz, Poland

OBJECTIVES

Chronic ingestion of fructose induces renal hypertrophy, release of monocyte chemoatractant protein 1 (MCP-1) by proximal tubular cell and macrophage infiltration of kidney interstitium. Fructose elevates uric acid and intrarenal renin-angiotensin system activity which decreases nitric oxide synthesis and results in glomerular hypertension. Thus fructose consumption may accelerate the progression of chronic kidney disease (CKD). This study was designed to evaluate the impact of 10% and 60% fructose diet on markers of kidney and endothelial injury and serum pro-inflammatory cytokines in subtotally nephrectomized rats (SNx).

METHODS

Male Wistar rats (380±40 g) underwent simultaneous uni-nephrectomy and resection of 2/3 contra-lateral kidney cortex (SNx=18) to induce experimental model of CKD. Animals were further assigned to 3 different diets protocol: RD - regular with fructose concentration <3%, F10 - 10% fructose in drinking water and F60 - 60% fructose as pellets (Harlan). After 8 weeks of experiment serum concentration of creatinine (Cr), fructose (F), uric acid (UA), soluble intercellular adhesion molecule (sICAM) and homocysteine (HCY) were measured. Additionally, urinary protein to creatinine ratio (PCR), N-Acetyl-(D)-glucosaminidase (NAG), MCP-1, as well as urinary sodium excretion (NaE) and uric acid excretion (UAE) were measured. Uric acid clearance (UACl) and creatinine clearance (CrCl) in a 24-hour urine collection were assessed. Statistical analysis: data were determined by factorial analysis of variance, with intergroup comparisons assessed by Bonferroni's post hoc method. $p<0.05$ was considered to be significant.

RESULTS

Animals did not differ in total calories intake per day at the end of diet protocol.
The number of calories derived from fructose ingested by rats differ significantly between the groups: 2,7±0,3 vs. 27,3±10,5 vs. 55,1±5,0 kcal/day for RD vs. F10 vs. F60, respectively.
Results are presented as mean ± SD in the Table.

	SNx+RD (I)	SNx+F10 (II)	SNx+F60 (III)	P ANOVA	P Bonferoni
Weight gain [gram/day]	2,8±0,4	3,44±1,0	2,37±0,5	0,0004	I vs III II vs III
Fructose [mg/dl]	0,88±0,4	1,21±0,9	1,11±0,5	NS	NS
BUN [mg/dl]	39,8±10,7	28,5±8,4	45,0±33,6	NS	NS
CrCl [ml/min]	1,61±0,6	2,0±0,2	1,29±0,4	0,01	II vs III
UA [mg/dl]	1,59±0,3	1,5±0,2	2,04±1,3	NS	NS
UAE [mg/24]	1,1±0,4	1,43±0,52	0,9±0,4	NS	NS
UACl [ml/min]	0,05±0,01	0,07±0,02	0,04±0,01	0,02	II vs III
HCY [µmol/l]	5,2±1,3	6,7±0,9	10,1±2,8	0,0001	I vs III II vs III
sICAM [ng/ml]	37,8±16,8	29,4±8,8	23,9±8,6	NS	NS
PCR [mg/mg creatinine]	23,6±15,9	9,4±6,1	12,3±11,2	0,04	I vs II
MCP-1 [ng/mg creatinine]	8,7±6,4	3,9±4,4	5,3±4,0	NS	NS
NAG [U/g creatinine]	35,9±18,2	18,7±6,6	27,3±11,2	0,03	I vs II
NaE [mg/day]	55,7±32,3	37,9±6,5	82,8±54,1	0,04	II vs III

CONCLUSIONS

F10 given as a liquid as compared to solid F60 increases CrCl and UACl.
F10 as compared to regular diet is associated with lower proteinuria and NAG excretion.
F60 diet induces an increase of HCY and hyperuricemia which may contribute to progression of CKD.
The effect of fructose on kidney function depends on the formula and the dose of fructose given to SNx rats.

51ERA-EDTA
267--MP
H) Clinical Nephrology, CKD. H6) Nutrition, inflammation and oxidative stress in CKD 1-5.
Mariusz Flisi&324;ski
DOI: 10.3252/pso.eu.51era.2014
Poster presented at: 51 ERA-EDTA CONGRESS AMSTERDAM THE NETHERLANDS MARCH JUNE 2014
PosterSessionOnline.com