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DIAGNOSTIC VALUE OF CYSTATIN C IN PATIENTS WITH HYPERTENSION AND OBESITY

Yarmukhamedova Saodat Khabibovna
Khusainova Munira Alisherovna
Ergasheva Ma'mura Tashtemirovna
Yarmatov Suvon Totlibayevich
Khaydarov Sanjar Nizamitdinovich
Uzokov Jurabek Baxtiyorovich
Samarkand State Medical University

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Abstract:

The evaluation of the diagnostic value of cystatin C in patients with hypertension (HP) in combination with obesity was carried out and the values of the calculated glomerular filtration rate (GFR) were compared based on the concentration of creatinine and cystatin C. 2 groups of patients were examined: group 1 – 32 patients diagnosed with HP 1 risk of category 2 with obesity, aged 20 – 44 years old (mean age 32 ± 1.3 years) with a well–established protein-synthetic liver function; group 2 - 33 practically healthy patients (comparison group), reliably comparable in gender and age. It was revealed that the level of cystatin C in the group of patients with HP and obesity was significantly higher (1.77 ± 0.14 mg/l) compared with the comparison group (0.74 ± 0.02 mg/l). GFR in patients with HP in combination with obesity, based on the determination of creatinine levels was 127.3 ± 4.2 ml/min. and it was significantly higher than the GFR value in this category of patients, calculated by the level of cystatin With 50.3 ± 4.2 ml/min /1.73 m^2, since the calculation of GFR by creatinine is influenced by the body weight of patients, and it was excessive. It is advisable to calculate GFR in obese patients with HP by the level of cystatin C, since it more accurately determines the presence of renal dysfunction in patients.

Keywords: cystatin C, hypertension, obesity, kidney dysfunction

INTRODUCTION

Recent studies have shown that impaired renal function is an important risk factor for the development of cardiovascular complications. Prolonged renal dysfunction can lead to rapid decompensation of kidney function and chronic renal failure. For early diagnosis of the functional state of the kidneys and assessment of the risk of cardiovascular complications, cystatin C is currently being considered – a non-glycolized 13-kDa main protein belonging to the group of cystatin protease inhibitors, due to its small size and high pH, it is freely filtered by glomeruli, reabsorbed in the renal tubules without returning to the bloodstream, which allows it to be to be considered as a possible marker of kidney function. Identification and evaluation of early markers of the functional state of the kidneys is extremely important for the timely formation of therapeutic and preventive programs.

The aim of the study was to evaluate the diagnostic value of cystatin C in patients with hypertension (HP) in combination with obesity and to compare the estimated glomerular filtration rate (GFR) based on the determination of creatinine and cystatin C concentrations.

MATERIALS AND METHODS

The work was carried out on the basis of the therapeutic department of SamMU. 2 groups of patients were included in the study. Group 1 consisted of 32 patients aged 20-44 years (average age 32 ± 1.3 years) with a rich protein–synthetic liver function, adhering to a normosolic diet, and an established diagnosis: Arterial hypertension 1 art. risk category 2 with obesity. Among the surveyed men - 16 (50%), women - 16 (50%). The 2nd group included 33 practically healthy patients, reliably comparable in gender and age. Exclusion criteria: the presence of diseases that can cause the development of secondary nephropathy; the presence of urological diseases; secondary, symptomatic hypertension; heart failure, coronary heart disease and cerebral pathology, oncological diseases; the presence of HIV, hepatitis B and C, tuberculosis; heavy physical activity and high-calorie food intake. -protein diet on the day of urine collection; fever; pregnancy and breast-feeding.

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Cystatin was determined by immunoturbidimetric method in all patients. In addition, creatinine was determined by kinetic test using Creatinine FS reagent (Dia Sys, Germany). Total protein, albumin and urea were studied by the enzymatic method. Microalbuminuria (MAU) was determined by a semi-quantitative method using microalbufan strips. The Cockcroft-Gault formula was used to calculate GFR by creatinine level, the Hook formula GFR [ml/min/1.73 m^2] = (80.35/cystatin C [mg/L]) – 4.32 was used to determine the level of cystatin C. Statistical processing was carried out on a Pentium – IV computer using MED_STAT program.

RESULTS

It was found that in the group of patients with HP in combination with obesity, significantly higher systolic and diastolic blood pressure (SAD and DAD) was observed compared to the comparison group. The average values of the studied indicators are presented in Table 1. As can be seen from Table 1, the growth of the group did not differ significantly. The calculated BMI was 32.2±0.7 kg/m^2 in the group of patients with HP combined with obesity and 23.2±0.4 kg/m^2 in the comparison group. The content of total protein and albumin in the group of obese patients with GB and in the comparison group fluctuated within the normal range and did not differ significantly, which characterizes the constancy of protein-synthetic liver function in patients with HP and obesity in accordance with the inclusion criteria. During the study, it was found that MAU was absent in both groups. The level of urea and creatinine fluctuated within normal values and did not differ significantly from the values of the comparison group.

The content of cystatin C in the group of patients with HP and obesity was significantly higher, amounted to 1.77± 0.14 ml/l and exceeded the upper limit of the norm.

In the course of the study, we calculated the GFR using the Hook formula. GFR in the comparison group corresponded to normal values of 106±3.1 ml/min/1.73 m^2, and GFR in the group of patients with obesity and HP was significantly lower than 50.3±4.2 ml/min/1.73 m^2 and corresponded to stage 3 of chronic kidney disease (moderate decrease in filtration).

Tables

Comparison of the average values of the studied indicators in the group of patients with GB and obesity with the comparison group

Indicator	Comparison group M ± m, n=33	HP and obese patients M ± m, n=32	t criterion
SAD, mmHg	111,5 ± 1,3	150,9 ± 1,7	P<0.05
DAD, mmHg.	72,4 ± 1,2	93,9 ± 1,0	P<0.05
Height, cm	172 ± 1,4	169,2 ± 1,4	P>0.05
Weight, kg	69,9 ± 1,9	92,2 ± 2,0	P<0.05
BMI (body mass index) kg/m^2	23,2 ± 0,4	32,2 ± 0,7	P<0.05
Total protein g/l	80,9 ± 0,7	76,6 ± 2,6	P>0.05
Albumin %	46,4 ± 0,8	47,9 ± 0,63	P>0.05
Urea, mmol/l	4,95 ± 0,2	5,5 ± 0,2	P>0.05
Creatinine, mmol/l	86,9 ± 2,5	89,9 ± 2,85	P>0.05
Cystatin C, mg/l	0,74 ± 0,02	1,77 ± 0,14	P<0.05
GFR for cystatin C (Hoek) ml/min/1.73 m^2	106 ± 3,1	50,3 ± 4,2	P<0.05

The calculation of GFR by creatinine level was carried out taking into account gender characteristics. The data presented in Table 2 indicate that creatinine levels in men and women in both groups fluctuated within the normal range and did not differ significantly. GFR in the group of obese patients with HP, calculated by creatinine level of 127.3±4.2 ml/min, significantly exceeds the values of GFR in the comparison group, amounting to 98.7±3.2 ml/min. This is due to the fact that the calculation was made taking into account body weight, which was higher in the group of patients with obesity and HP.

Table 2

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Comparison of the mean values of creatinine and GFR levels in men and women in the group of patients with HP and obesity with the comparison group

Indicator	Comparison group M ± m	HP and obese patients M ± m	t criterion
Creatinine (women), mmol/l	76,5 ± 1,78	81,1 ± 2,6	P>0.05
Creatinine GFR (women), ml/min.	90,9 ± 4,1	127,2 ± 6,7	P<0.05
Creatinine (men), mmol/l	98,1 ± 3,0	98,73 ± 4,0	P>0.05
Creatinine GFR (men), ml/min.	106,9 ± 4,4	127,5 ± 5,2	P<0.05
GFR (men and women), ml/min.	98,7 ± 3,2	127,3 ± 4,2	P<0.05

DISCUSSION

Our study showed that there is no proteinuric mechanism of progression of nephropathy in the group of patients with HP and obesity and in the comparison group (MAU of the morning urine portion was not detected). Creatinine content is influenced by muscle mass, age and gender. By gender and age, both groups were significantly comparable, with the exception of body weight, which was significantly higher in the group of patients with HP and obesity, which confirms the calculated BMI. Creatinine levels in both groups fluctuated within the normal range and did not differ significantly. GFR calculated by creatinine level significantly exceeds the values of GFR in the comparison group. The data obtained can be explained by the fact that a group of patients with HP has excess body weight, the level of which affects the calculation of GFR. The level of cystatin C is not affected by body weight, its concentration in the group of patients with HP and obesity was significantly higher and exceeded the upper limit of the norm. GFR calculated by the level of cystatin C was significantly lower and revealed a decrease in kidney filtration in the group of patients with HP and obesity, in contrast to creatinine.

CONCLUSION

GFR calculated by the level of cystatin C (Hoek formula) in the group of patients with HP and obesity was significantly lower and corresponded to stage 3 of chronic kidney disease (moderate decrease in filtration). Cystatin C is the most reliable indicator of the preservation of renal function, a more sensitive indicator of a decrease in GFR than creatinine and can be considered as an alternative marker for early detection of renal dysfunction, even with normal creatinine levels. It seems appropriate to evaluate GFR in patients with HP with obesity, calculated not only on the basis of the traditional Cockcroft-Gault formula with creatinine determination, but also by the level of cystatin C (Hoek formula), since it more accurately determines the presence of renal dysfunction in patients.

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