Comparison of Clinical and Laboratory Parameters in Patients with End-Stage Renal Failure in the Outcome of Chronic Glomerulonephritis and Patients with End-Stage Renal Failure in the Outcome of Other Diseases

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ABSTRACT

Background: frequent complications of hemodialysis treatments are coagulation disorders. This is due to activation of the coagulation of blood flow in the interaction with a dialysis membrane material vascular prostheses and extracorporeal circuit trunks. In addition, in hemodialysis patients receiving heparin for years, there is depletion of stocks in endothelial cells in tissue factor inhibitor, inhibits the activity of an external blood clotting mechanism.

Aim: the aim of our study was to evaluate the hemostatic system parameters in patients with end-stage renal failure, depending on the cause of renal failure.

Material and methods: to evaluate the hemostatic system parameters in patients with end-stage renal failure, depending on the cause of renal failure and hemodialysis treatment duration conducted a study that included 100 patients observed in the department of chronic hemodialysis and nephrology hospital №1 Republican National Medical Center in the period of 2013-2016.

Results: in patients with end-stage renal failure in the outcome of chronic glomerulonephritis, a great expression of activation of blood coagulation confirm increased the mean concentration of fibrinogen, whereas in the group, which included patients with end-stage renal failure in the outcome of other diseases, such is not different from the norm, and a higher rate of hyperfibrinogenemia, identified in 2/3 patients in this group.

Conclusions: it was revealed that the state of homeostasis in patients with end-stage renal failure in increasingly characterizes the level of fibrinogen and the activation of the hemostatic markers: soluble fibrin monomer complexes, D-dimers.

Key words: hemostasis, terminal renal failure, renal replacement therapy.

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INTRODUCTION

In Russia, according to the Register of the Russian Dialysis Society, in 2013, 35305 people received various types of renal replacement therapy, the annual increase in the number of patients with an average of 12.4% [1]. The average age of the patients in our country, receiving renal replacement therapy, is 47 years, the young, able-bodied part of the population greatly affected [2]. Frequent complications of hemodialysis treatments are coagulation disorders. First of all, this is due to activation of the coagulation of blood flow in the interaction with a dialysis membrane material vascular prostheses and extracorporeal circuit trunks [3]. In addition, in hemodialysis patients receiving heparin for years, there is depletion of stocks in endothelial cells in tissue factor inhibitor, inhibits the activity of an external blood clotting mechanism [4].

AIM OF THE STUDY

The aim of our study was to evaluate the hemostatic system parameters in patients with end-stage renal failure, depending on the cause of renal failure.

MATERIALS AND METHODS

The study included 100 patients: 59 women (59%) and 41 men (41%) aged 19 to 79 years (middle age 46,5 ± 14,6 years) observed in the department of chronic hemodialysis and nephrology of Republican Hospital National medical center №1 in the period from 2013 to 2016. All the patients at the time of inclusion in the study diagnosed end-stage renal disease (ESRD), which corresponded to the stage V chronic kidney disease (CKD), according to the criteria of clinical practice guidelines for CKD (KDIGO 2012 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease) by 2012 [5]. The cause of end-stage renal failure in most cases acts as chronic glomerulonephritis (CGN) - 43%, in second place (20%) - with diabetic nephropathy in type 2 diabetes [6].

The study was conducted in 2 phases: The purpose of Phase I was to find out what settings to change coagulation in patients with ESRD treated with hypertonia. In this part of the study included all patients who were treated in the department of chronic hemodialysis and nephrology hospital of Republican National Medical Center №1 in the period from 2013 to 2016. The purpose of phase II study was to compare blood coagulation parameters in patients diagnosed with ESRD in the outcome of CGN, are on the program of the hemodialysis, and ESRD patients in the outcome of other diseases. 84 patients were included in this part of the study.

Inclusion criteria were: all patients diagnosed with a cause of ESRD treated with hypertonia. Exclusion criteria were: unknown cause of ESRD patient's refusal of the study.

The patients were divided into groups depending on the

Table I. Indicators of coagulation in the total group

Index	Norm values	The average		The middle value
		min	max	
TT, seconds	16-26	14,5	32,9	22,5 ± 4,6
PT, seconds	9-12,6	8,1	17,9	10,65±2,45
INR	0,81-1,13	0,75	1,34	0,9±0,1
APTT, seconds	23,4-35	20	48,1	30,2±4,35
Fibrinogen, g / l	2-4	2,22	9,5	5±1,3
PTI, %	78-142	59,58	396,14	116±40,2
SFMC	<4	4,5	26	10±6,3
D-dimer	<500	0,34	1184	230±355,5

cause of ESRD: the outcome of the CGN or in the outcome of other diseases (type 1 diabetes, type 2 diabetes mellitus, systemic disease, polycystic kidney disease, hypertensive nephroangiosclerosis, anomalies of development of kidneys, chronic pyelonephritis, urate nephropathy). Group A consisted of 43 patients (20 men: 23 women) aged 19 to 61 years (38 ± 10.5 years), diagnosed with ESRD in the outcome of chronic glomerulonephritis. In group B included 41 patients (15 men: 26 women) aged 22 to 79 years (57 ± 15 years), diagnosed with ESRD in the outcome of other diseases.

To describe the data X calculated average value and standard deviation (σ) of the studied parameters. Determination was carried out by Spearman correlation method. Authentic differences at $p < 0.05$ shall be deemed. All calculations were performed on a PC using SPSS 10 for Windows software packages.

RESULTS AND DISCUSSION

The following results were obtained by processing the data: 18 patients (18%) were diagnosed with thrombosis of arteriovenous fistula (AVF), 5 patients (5%) was revealed thrombosis of vessels of other organs and systems. Bleeding in patients was found, anemia associated with all erythropoietin deficiency.

In the study a total level of blood platelets, it was found that the platelet count in the total group averaged 263 ± 97,2 x 10^9 / L (55 to 502 x 10^9 / L). Thrombocytopenia rate was 10%, thrombocytosis - 13%.

The study revealed coagulation parameters: thrombin time (TT) in patients ranged from 14.5 to 32.9 seconds (average 22,5 ± 4,6 seconds) at a rate of 16-26 seconds. Prothrombin Time Indicators (PT) - from 8.1 to 17.9 seconds (average 10,65 ± 2,45 seconds) at a rate 9-12,6 seconds. Prothrombin index (PTI) - from 59.58 to 396.14% (mean 116 ± 40.2%) at normal rates 78-142%. The international normalized ratio (INR) of 0.75 to 1.34 (mean 0,9 ± 0,1), the norm: 0,81-1,13. Activated partial thromboplastin time (APTT) of 20 to 48.1 seconds (mean value of 30,2 ± 4,35 seconds) at a rate of 23,4-35 seconds. Fibrinogen level from 2.22 to 9.5 g / l (mean value of 5.0 ± 1.3 g / l) at a rate of 2-4 g / l.

A blood test for soluble fibrin monomer complex (SFMC) was taken in 26 patients, figures ranged from 4.5 to 26 mg% (mean 10 ± 6,3 mg%) at a rate of up to 4 mg%.

D-dimers were detected in 46% of patients ranged from indicators 0.34 to 1184 ng / mL (mean 230 ± 355,5 ng / ml) at a rate of less than 500 ng / ml (Table 1).

At the second stage of the study, we compared the patients with ESRD in the end of the CGN and the outcome of other diseases (of 84 people). Group A consisted of 43 patients (20 men: 23 women) aged 19 to 61 years (38 ± 10.5 years), diagnosed with ESRD in the outcome of chronic glomerulonephritis. In group B included 41 patients (15 men: 26 women) aged 22 to 79 years (57 ± 15 years), diagnosed with ESRD in the outcome of other diseases. From the study excluded 16 patients with unclear etiology of ESRD.

In both groups, the platelet count was almost the same. In group A platelet level averaged 276 ± 103 x 10^9 / L (range 61.2 to 502 x 10^9 / L). In group B - 265 ± 98 x 10^9 / L (55 to 495 x 10^9 / L). The frequency of thrombocytopenia and thrombocytosis was low and comparable in both groups (Table 2).

The average values of "routine" of hemostasis (TT, PT, INR, APTT, PTI) did not deviate from the norm and were similar in both groups (Table 3).

In group A, the value of thrombin time in patients ranged from 14.5 to 32.9 sec, an average of 23.3 ± 4,8 seconds. Shortening TT was observed in 3 patients, elongation - in 12 patients. In group B thrombin time values in patients ranged from 16.3 to 31.8 sec, an average of 22 ± 4,8 seconds. Shortening TT is not mentioned in any of the patient, TT elongation was 7 patients.

The values of the prothrombin time in group A patients ranged from 8.5 to 17 seconds, an average of 10 ± 2,45 seconds. Shortening PT was observed in 7 patients, elongation - in 15 patients. In group B prothrombin time values in patients ranged from 8.1 to 17.9 seconds on average 10.9 ± 2.6 seconds. Shortening PT was observed in 6 patients, elongation - in 16 patients.

The values of the international normalized ratio in group A patients ranged from 0.77 to 1.2 seconds, on average 0,91 ± 0,1 seconds. Reducing the INR was observed in 5 patients, an increase - in 1 patient. In Group B patients INR values ranged from 0.75 to 1.28 seconds, on average 0.9 ± 0.1 seconds. Reducing the INR was observed in 5 patients, an increase - in 6 patients.

Values of activated partial thromboplastin time in Group A patients ranged from 20 to 39.9 seconds on average 30.2 ± 4.5 seconds. The shortening of the APTT was observed in 4 patients, elongation - in 8 patients. In group B patients APTT values ranged from 24.5 to 48.1 seconds on average 30.5 ± 4.4 seconds. The shortening of the APTT is not mentioned, the extension - in 4 patients.

Table II. Frequency of thrombocytopenia in patients with ESRD in the outcome of CGN and patients with ESRD in the outcome of other diseases.

Groups	platelet count, x10^9/l		
	thrombocytopenia <150 x 10^9/l	Norma 150-400 x 10^9/l	Thrombocytosis >400 x 10^9/l
Group A (n=43)	5 (11,6 %)	31 (72,1 %)	7 (16,3 %)
Group B (n=41)	4 (9,8 %)	32 (78 %)	5 (12,2 %)
Note: p > 0,004 (between t A and t B.)			

Table III. Coagulation indicators of patients at stage II

Index	Group A	Group Б	Norma	p
TT, seconds	23,3±4,8	22±4,8	16-26	NS
PT, seconds	10±2,45	10,9±2,6	9-12,6	NS
INR	0,91±0,1	0,9±0,1	0,81-1,13	NS
APTT, seconds	30,2±4,5	30,3±4,4	23,4-35	NS
PTI, %	128,6±27,2	109,4±53,2	78-142	p=0,03

PTI values in group A patients ranged from 73 to 181.8%, with an average 128,6 ± 27,2%. Reducing the PTI noted in 1 patient, increase - in 13 patients. In group B the values of prothrombin index in patients ranged from 68 to 396.14%, the average 109 ± 53,2%. Reducing the PTI noted in 3 patients, an increase - in 9 patients.

Average levels of antithrombin III (AT III) were normal and did not differ in both groups. In group A, the average level of AT III was 103.5 ± 21.7% (from 70 to 161.96%) in group B - 104 ± 21,1% (from 82.92 to 134%). In this case more than 1/3 of the patients group B and up to 30% group A marked high values of AT III, exceeding the physiological rate.

In group A greater intensity of activation of blood clotting confirm increased the mean concentration of fibrinogen, whereas in group B such does not differ from the norm (cf. fibrinogen level in group B - 4.07 ± 1,6 g / l, group A - 5,09 ± 1,1 g / l (p = 0.004)), and a higher rate of hyperfibrinogenemia, identified in 2/3 patients in this group.

CONCLUSION

Thus, in group A (n = 43), which included those with ESRD in the outcome of CGN, recorded lower figures of blood pressure than in group B (n = 41), which included patients with ESRD in the outcome of other diseases. In group A, patients with diagnosed hypertension accounted for 41.5%, in group B 61.4%.

Severity of anemia in patients with ESRD in the outcome of CGN, was the same as that of untreated hemodialysis over a year. Patients in both groups did not differ (P> 0.05) in the levels of creatinine (865.2 ± 269 mmol / l in group A; 812,6 ± 226 mmol / l in group B.).

Thrombosis AVF in ESRD in the outcome CGN occurred in 7 patients in the outcome of other diseases of the kidneys - in 11 patients (in the outcome of diabetic nephropathy in type 2 diabetes - 3, hypertensive nephroangiopathy - 3, systemic diseases - 1, polycystic kidney - 1, urate nephropathy 1).

Indicators of platelet hemostasis in both groups were similar (in group A 276 ± 103 x 10^9 / l, group B 265 ± 98 x 10^9 / l. The frequency of thrombocytopenia and thrombocytosis was small and comparable in both groups.

The average values of "routine" of hemostasis (TT, PT, INR, APTT, PTI) did not deviate from the norm and were similar in both groups.

In group A greater intensity of activation of blood coagulation confirm increased the mean concentration of fibrinogen, whereas in group B such does not differ from the norm (the average level of fibrinogen in group B - 4.07 ± 1,6 g / l, in group A - 5, 09 ± 1,1 g / l (p = 0.004)), and a higher rate of hyperfibrinogenemia, identified in 2/3 patients in this group.

REFERENCES

1. Bikbov B.T. et al., Substitution therapy terminal chronic renal failure in the Russian Federation in 1998-2013 years. Report to the Russian Register of renal replacement therapy, Nephrology and Dialysis, 2015, №3 (50), P. 3-14.
2. Gafter U., Bessler H., Malachi T., Platelet count and thrombopoietic activity in patients with chronic renal failure, Nephron, 2012, № 45(50), P. 207-210.
3. Suslov, V.P., Assessment of risk of thrombosis in patients with chronic renal failure on dialysis stage, Cytometry in medicine and biology: fundamental and applied aspects, Moskva, 2008, P. 56-57.
4. Barkagan Z.S. et al., Diagnosis and therapy of disorders of hemostasis controlled, Moskva, Nyudiamed, 2012, P. 165.
5. Smirnov A.V. et al., Chronic kidney disease: the basic principles of screening, diagnosis, prevention and treatment approaches: National guidelines, SPb.: "Publisher Lefty. Saint Petersburg ", 2012, P. 54.
6. Ilyin A.P. et al., Thrombophilia in hemodialysis patients with chronic renal failure, Kazan: Kazan-print, 2011, P. 56.

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