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Research Article

Clinical characteristics of arterial hypotension in hemodialysis patients

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ABSTRACT
There has been a steady increase in the number of patients with chronic kidney failure (CKD) worldwide. In CIS countries in the last decade chronic renal insufficiency has been registered with the frequency of 100-600 people per 1 million populations. Since the information on the prevalence of chronic renal failure (CRF) is based on circulating or dialysis center data, the true prevalence of CRF may be underestimated. The following substitution therapies are currently widely used to treat terminal stage chronic kidney disease (CKD): hemodialysis and permanent outpatient peritoneal dialysis, which can significantly prolong the lives of patients. [2, 8, 10]. Over the past five years, the number of patients in the world who are on kidney substitution therapy has increased by more than 25% and currently stands at over 2 million people. The largest growth in the number of such patients was recorded in developing countries (including Uzbekistan) - more than 50% in 5 years [5, 9]. A survey of 102 patients (59 women and 43 men) with CKD of stage 5 was conducted.

Keywords: sidial arterial hypotension, hemodialysis, chronic renal insufficiency, ultrafiltration.

INTRODUCTION
Currently, the following replacement therapy methods are widely used to treat the terminal stage of chronic kidney disease (CKD): hemodialysis and continuous outpatient peritoneal dialysis, which can significantly extend the life of patients [3, 11].
Hemodialysis is a high-tech procedure associated with the use of multicomponent equipment, extracorporeal circulation, correction of water-electrolyte balance, changes in the acid-base state and osmolar equilibrium. In this regard, hemodialysis is accompanied by various complications. One of the most common complications is syndialytic hypotension (SDH) [6, 12]. According to various authors, LDH is detected in 25-55% of patients [4, 7, 13]. Arterial hypotension induced by the hemodialysis procedure increases the risk of vascular access thrombosis [4, 8, 10]. The presence of IDH episodes also affects the development of atrophy of the frontal lobes of the brain, which leads to functional neurological disorders and a deterioration in the quality of life [3, 5, 6]. Currently, there is no doubt the unfavorable prognostic value of SDH. Mortality in patients with SDH can reach 10-15% per year [13].

PURPOSE OF THE STUDY
Determine the conditions for the occurrence of syndialytic arterial hypotension.

MATERIALS AND RESEARCH METHODS
102 patients (59 women and 43 men) with stage 5 CKD were examined. The average age of patients was 50.3 ± 2.4 years.
The criteria for inclusion in the study were the presence of stage 5 CKD according to the classification of the United States National Kidney Fund (NKF: K / DOQI Clinical Practice Guidelines for Chronic Kidney Disease, 2002) and renal replacement therapy with programmed hemodialysis for 1 year or more. Exclusion criteria were acute myocardial infarction or acute cerebrovascular accident, paroxysmal cardiac arrhythmias, acute purulent-inflammatory and infectious diseases, diseases of the thyroid gland and adrenal glands, erosive and ulcerative lesions of the gastrointestinal tract and an indication of acute blood loss in history. The development of chronic renal failure was due to: chronic glomerulonephritis in 51.0%, diabetic nephropathy in 13.7%, polycystic kidney disease in 8.8%, hypertension in 6.9%, congenital renal dysplasia in 5.9% , chronic pyelonephritis - in 3.9%, other diseases (renal amyloidosis, gouty nephropathy, bilateral renal artery stenosis, chronic tubulointerstitial nephritis, unspecified causes) - in 9.8% of patients. Clinical and anamnestic data were studied in detail. The nature of drug therapy was evaluated. We analyzed the features of the hemodialysis procedure that can affect the likelihood of developing IDH (the frequency and duration of hemodialysis sessions, the composition of the dialysis solution, the type of dialyzer, the amount of ultrafiltration, etc.).

Measurement of blood pressure was performed before the start of the hemodialysis session, during the session (with an interval of 1 hour) and after it was completed, the relative (percentage) decrease in systolic and diastolic blood pressure was calculated for 1, 2, 3, 4 hours and for the entire duration of the hemodialysis procedure. The IDH episodes were considered to decrease systolic blood pressure below 100 mmHg. or more than 20 mmHg. compared to the pre-dialysis level in case of clinical symptoms.

All patients underwent clinical and biochemical blood tests, additional instrumental studies and specialist consultations were conducted to exclude gastrointestinal diseases, endocrinological diseases and other possible causes of secondary arterial hypotension. We also evaluated electrocardiography data in 12 conventional leads (to identify exclusion criteria) and echocardiography (to study the size of the heart chambers, its wall thickness and myocardial contractility). Statistical processing was carried out using the Microsoft Excel software package (version 14.0). When conducting statistical processing, methods of parametric and nonparametric statistics were used.

RESULTS OF THE STUDY

Out of the 102 patients included in the study, episodes of SDH within 1 year were observed in 71 patients. Among them were 32 people with frequent episodes of SDH (on average, 6.59 ± 0.87 per month) and 39 people with relatively rare episodes of SDH (on average, 0.87 ± 0.14 per month). Patients without episodes of SDH (31 people) made up the control group. Differences in the frequency of SDH in men and women were not statistically significant (2.2 ± 1.2 and 3.8 ± 0.9 episodes per month, respectively). The results of the study showed that the most common episodes of SDH occur in patients with diabetic nephropathy. The relative risk of developing IDH in patients with chronic glomerulonephritis is 62% less, and in patients with polycystic kidney disease - 81% less. The duration of hemodialysis treatment ranged from 12 to 288 months. The average duration of hemodialysis treatment was maximum in patients with frequent episodes of SDH, comprising group 2 (111.9 ± 12.6 months), and minimum in the control group (70.5 ± 14.8 months). The differences between these groups were statistically significant ($t = 2.14$; $p = 0.041$). The average duration of hemodialysis treatment in the group with relatively rare episodes of IDH was 83.7 ± 10.6 months. The average levels of predialysis systolic and diastolic blood pressure for 1 month of observation were: in the group of patients with rare episodes of SDH - 136.8 ± 3.2 and 79.7 ± 1.8 mm mmHg., in patients with frequent episodes of SDH - 116.7 ± 4.4 and 70.8 ± 2.4 mmHg., in the control group (without episodes of SDH) - 148.5 ± 6.3 and 84.6 ± 3.1 mmHg., respectively. In the majority of patients in the control group, the figures of pre-dialysis blood pressure corresponded to arterial hypertension (mainly systolic). When conducting a correlation analysis, we found that the pre-dialysis indicators of systolic blood pressure negatively correlate with the duration of hemodialysis treatment ($rs = -0.240$; $p = 0.017$) and the average monthly number of episodes of SDH ($rs = -0.399$; $p < 0.001$). Similar, but less powerful, correlation relationships were identified for indicators of diastolic, middle and pulse pre-dialysis blood pressure. Analyzing the intradialytic indicators of blood pressure, we found that in most patients, episodes of SDH developed 3-4 hours after the onset of hemodialysis. The duration of the episode in 60.6% of cases did not exceed 1 hour, in 18.3% - from 1 to 2 hours, in 5.6% - from 2 to 3 hours, in 7.0% - more than 3 hours. The average values of systolic and diastolic blood pressure after 1 hour and 2 hours after the start of the hemodialysis procedure did not significantly differ from the corresponding indicators of pre-dialysis and post-dialysis blood pressure. Mean systolic blood pressure after 3 hours (112.3 ± 4.1 mm Hg) and 4 hours (103.8 ± 2.6 mm Hg) after hemodialysis started, as well as post-dialysis blood pressure (117.0 ± 4.2 mm Hg), were significantly lower than the pre-dialysis level - 145.0 ± 4.7 mm Hg. Art. ($p < 0.01$). Diastolic blood pressure after 3 hours (62.4 ± 1.8 mm Hg) and 4 hours (60.0 ± 1.5 mm Hg) after the start of the procedure were also below the pre-dialysis level - 76.3 ± 2.3 mmHg Art. ($p < 0.001$). Postdialysis diastolic blood pressure did not significantly differ from predialysis. Averaged (according to hourly measurements) intradialysis indicators of systolic blood pressure correlated: negatively with the duration of hemodialysis treatment ($rs = -0.458$; $p = 0.042$) and intradialystic weight gain ($rs = -0.469$; $p = 0.037$). In many patients, episodes of IDH were combined with arterial hypertension in the intradialystic period or during other hemodialysis sessions. Antihypertensive drugs were received by 68.6% of patients under observation. ACE inhibitors were most often prescribed, less commonly, β-adrenergic blockers and calcium channel blockers. 65.7% of patients received erythropoiesis stimulants. Significant differences in the frequency of prescription of erythropoiesis stimulants and the main classes of antihypertensive drugs between groups of patients with episodes of SDH and without episodes of SDH were not detected. Most patients observed received

hemodialysis 3 times a week. 5 out of 71 patients with episodes of IDH (7.0%) were on hemodialysis twice. The average monthly number of SDH episodes and relative changes in blood pressure during the hemodialysis procedure in these patients did not significantly differ from other patients, however, a correct comparison was not possible due to the small size of the group, as well as differences in age, body weight, and other clinical and laboratory parameters. In general, according to our data, the hemodialysis regimen did not have a significant effect on the incidence of SDH. However, we do not exclude that this factor may be relevant in situations where existing recommendations for determining the adequacy and dose of hemodialysis are not followed.

The intradialytic gain in body weight ranged from 0.8 to 5.3 kg. The absolute value of the increase in body weight did not correlate with the age of the patients, the duration of hemodialysis treatment, and pre-dialysis blood pressure. However, there was a statistical relationship with the average intradialytic values of systolic blood pressure ($rs = -0.469$; $p = 0.037$) and the relative (percentage) change in systolic and diastolic blood pressure for the entire hemodialysis procedure ($rs = -0.262$; $p = 0.012$ and $rs = -0.312$; $p = 0.002$, respectively). The amount of ultrafiltration was closely associated with interdialysis weight gain ($rs = 0.795$, $p < 0.001$) and ranged from 0.1 to 4.9 liters. When conducting a correlation analysis, we found that in most cases the correlations of the main clinical data with the relative magnitude of ultrafiltration are of greater strength and statistical significance than correlations with the absolute indicator. When studying laboratory data, it was found that patients with relatively rare episodes of SDH and with frequent episodes of SDH had lower hemoglobin compared with patients in the control group who did not develop SDH (108.3 ± 2.4, 107.2 ± 3.1 and 117.0 ± 2.2 g/l, respectively). Similar differences were also characteristic of the hematocrit level (31.5 ± 0.8, 31.9 ± 0.7 and 34.6 ± 0.8%, respectively). Significant intergroup differences in the average hemoglobin content in the erythrocyte, the average volume of red blood cells, the number of leukocytes, platelets and ESR were not detected. An echocardiographic study was performed to identify left ventricular hypertrophy and assess myocardial contractility. Left ventricular hypertrophy, diagnosed by MMILV, was observed in the vast majority of patients (91.2%). The main echocardiographic parameters had negative correlation with the average monthly number of IDH episodes and positive correlations with pre-dialysis and post-dialysis blood pressure, as well as with a relative change in systolic blood pressure over the entire hemodialysis session. Systolic dysfunction of the left ventricle was observed in less than a fifth of patients. An ejection fraction of less than 40% was not observed.

CONCLUSION

1. The frequency of episodes of syndialytic hypotension was correlated with the duration of hemodialysis treatment and the nature of the underlying disease.
2. In patients with diabetic nephropathy, syndialytic hypotension was observed 2.6 times more often than in patients with chronic glomerulonephritis, and 5.3 times more often than in patients with polycystic kidney disease ($p < 0.01$).
3. The average monthly number of episodes of intra-dialysis hypotension negatively correlated with the average level of both pre-dialysis systolic ($rs = -0.399$; $p < 0.001$) and post-dialysis systolic blood pressure ($rs = -0.691$; $p < 0.001$).
4. The frequency of intradialytic hypotension in the absence of clinically significant heart diseases does not correlate with systolic dysfunction of the left ventricle.

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