

Analysis of lethal outcomes in patients on renal replacement therapy and the identification of risk factors.

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Introduction

There are almost two million patients on renal replacement therapy with the prevalence of maintenance hemodialysis in the world. The number of patients requiring renal replacement therapy (RRT) is increasing in Russia. Annually despite the constant steady increase in the availability of RRT and the progress achieved in technical support and drug therapy the survival remains rather poor.

Objectives

To identify risk factors for death in patients with RRT.

Methods

The study involved 158 patients receiving RRT maintenance hemodialysis for the period from 09.2013 until 09.2018. During this time, 28 patients (17.72%) died. Data of survivors and deceased patients were studied separately.

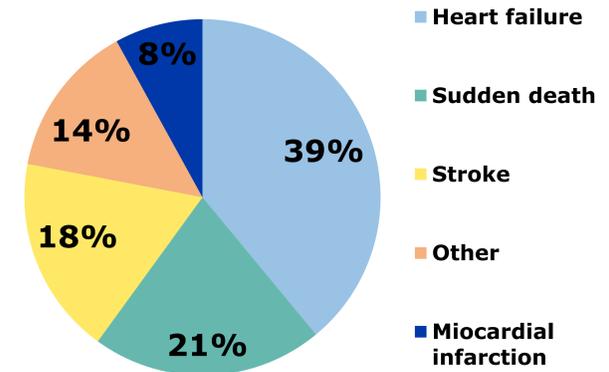
Group 1 - survivors: 130 patients getting RRT for as long as 4 up to 210 months, age from 18 up to 80 years old (average 54.21 years old), 57 female; 73 male;

Group 2 - deceased: 28 patients getting RRT for as long as 4 up to 144 months, age from 37 up to 81 years old (average 61.79 years old), 9 female, 19 male.

Accomplished a comparative analysis of a number of clinical and laboratory studies for 5 years (2013-2018). The following parameters were selected for analysis: hemoglobin, cholesterol, CRP, nutritional status, calculated body mass index (BMI), Charlson's comorbidity index (CI) with age correction and the average value for all indicators was calculated.

To determine the statistical significance of differences in mean values, the Student's t - test with the calculation of the degree of freedom (df) was used and the level of statistical confidence was determined at $p \leq 0.05$.

Lethal cases structure



Results

In the mortality pattern of 39.29% of cases, the cause of death was heart failure, 21.43% - sudden death, 7.4% - myocardial infarction, 17.86% - stroke, 14.29% - other reasons. Concomitant diseases in group 2: malignant neoplasms are 21.43%, insulin-dependent diabetes mellitus - 39.29%, vascular atherosclerosis - 28.57%, hypertension - 17.86%, anemia of various genesis - 89.29%. The average age in group 2 was higher than in group 1 by 7.58 years.

When assessing the nutritional status of the studied groups for the presence of protein - energy malnutrition, it was revealed:

BMI: in group 1 62 (47.69%) of patients had normal body weight, 11 patients (39.3%) in group 2. 3 patients from group 1 2.31% had a body mass deficiency (BMI <18.5). Excess weight was found (BMI up to 29.9) in 1 group 31.25%, in group 2 35.7%. Obesity (BMI ≥ 30), leading to general morbidity and mortality, had in the first group 18.75%, in the second group 25% of cases.

Total protein: the concentration of total protein in the blood between the groups did not differ and was within the normal range (60-90g / l), group 1 - 67.12g / l, group 2 - 66.15g / l.

Albumin: the norm - 40 g / l. In the group of survivors, the level of albumin was 42.71 g / l, in the group of the deceased - 37.92 g / l.

The study shows the absence of protein - energy malnutrition.

The differences between the study groups in BMI, total protein and albumin were minimal and statistically unreliable.

There were no significant differences in the concentration of total cholesterol in the blood between the groups. Indicators were within the normal range (3.5-7 mmol / l), group 1 - 5.77 mmol / l, group 2 - 5.31 mmol / l.

Significant differences were in terms of hemoglobin level, with a target value of 120 g / l in group 1 equal to 111.4 g / l, in the 2nd group - 96.78 g / l.

For CRP, the upper limit of the laboratory norm of 5 mg / l was taken as the threshold value. It was revealed that the risk of death was high in the group of the deceased and had a CRP level of 26.5 mg / l, in the group of survivors the level of CRP was 6.89 mg / l.

Important for assessing the causes of deaths is the Charlson comorbidity index with the age group corrections. When comparing groups by Charlson CI, it was found that in group 1 patients had CI in an average of 4.97 points, in group 2, the values of CI were significantly higher and amounted to 7.07 points.

Discussion: It is known from sources¹ that C-reactive protein (CRP) (marker of the acute phase of inflammation) is an accurate predictor of mortality for patients. When CRP is above 10 mg / l, the risk of mortality within 5 years increases 3.5 times. With CI level ≥ 5 , 10-year survival rate is 21% or lower¹⁰.

Consider ferritin as a marker of inflammation, and not as a depot of iron³. When analyzing the concentration of ferritin in the blood of the group of deceased, the value was rather high 1133.04 $\mu\text{g} / \text{l}$, in the group of survivors 612 $\mu\text{g} / \text{l}$, at a normal rate of 200-800 $\mu\text{g} / \text{l}$.

Conclusion

Cardiovascular complications prevailed in the structure of mortality. CRP is a predictor of cardiovascular disease (CVD) and mortality in patients on hemodialysis. It is advisable for patients to take statins even in the absence of hyperlipidemia. According to some sources¹, this reduces CRP below 2 mg / l, and reduces the likelihood of heart attacks by 50%. If at a high CRP level there are no obvious signs of inflammation, the patient should be examined for cancer.

Patients with obesity grades I-III deserve special attention and get qualified nutritionists, physical therapy specialists with experience working with patients suffering from chronic kidney disease.

Anemia as a complication of chronic kidney disease takes first place; the correction of this condition will definitely increase not only the quality of life, but also the survival rate of patients with RRT.

The risk of death in RRT can be considered age over 61 years, Charlson CI ≥ 5 , CRP above 5 mg / l and high levels of ferritin.

Calcium - phosphorus metabolism disorder as a risk factor for deaths deserves a separate and more in-depth study.

Average value	Age years old	Protein - energy malnutrition						Cholesterol mmol / l	Hemoglobin g / l	C-reactive protein mg / l	Charlson CI	Ferritin mcg / l
		BMI%				Albumen g / l	Total protein g / l					
		Deficiency	Norm	Excess	Obesity							
1group survivors	54,21*	2,31	47,69	31,54	18,46	42,7	67,12	5,77	111,4*	6,89*	4,97*	612*
2 group dead	61,79*	-	39,3	35,7	25	37,92	66,15	5,31	96,78*	26,5*	7,07*	1133,04*

* Differences between groups are significant ($p \leq 0,05$).

References

- Laboratory. Journal for doctors (2006) Velkov V.V. C-reactive protein: new opportunities for laboratory diagnostics.
- Elizabeth Selvin, PhD, MPH; Nina P. Paynter, MHS; Thomas P. Erlinger, MD, MPH. Arch Intern Med. (2007) The Effect of Weight Loss on C-Reactive Protein: A Systematic Review.
- Veremeenko D. (2016) Ferritin - a marker of risk of cancer
- Tutorial. (2015) Protein-energy deficiency in patients with chronic kidney disease on dialysis therapy.
- K.A. Vishnevskii, A.E. Belyaev, A.N. Mironenko (2015) Polymorbidity as a predictor of mortality in patients on constant renal replacement therapy with hemodialysis.
- Melentyeva A. A., Barysheva O. Yu., Tikhova G. P. (2015) Factors of influence on the survival of patients with chronic kidney disease on hemodialysis.
- Abramova E.E., Korolev I.E., Tov N.L., Movchan E.A., Naborschikov D.A. (2000) Risk factors for lethal outcomes in patients on hemodialysis.
- Journal "Nephrology and dialysis" № 3 (2008) E.V. Shutov Nutritional status in patients with chronic kidney disease.
- Journal "Clinical Nephrology" №1 (2011) Rtishcheva O.V., Kalev O.F., Akhmatov V.Yu. The structure of the causes of deaths in patients who were on programmed hemodialysis.
- Charlson ME, Pompei P, Ales KL, McKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chron Dis 1987.