

Analysis of Death and Related Factors Within 1 Year in Elderly Patients on Maintenance Hemodialysis

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Abstract

Objective: To investigate the short-term (within 3 to 12 months) survival of elderly MHD patients and analyze the mortality risk factors of patients. **Methods:** The clinical data of 45 elderly patients with regular MHD treatment from January 2015 to December 2022 and died within 3 to 12 months were selected as the death group. Moreover, 45 elderly patients with regular MHD treatment and the survival period was more than 12 months were selected as the control group. The cause of death, basic clinical data, and laboratory indicators were investigated. **Results:** The mean time from hemodialysis initiation to death for the 45 patients in the death group was (9.04 ± 2.16) months. The primary causes of death: cardiovascular disease (46.67%) ranked first, and the causes of infection (22.22%) ranked second. Logistic Regression analysis, the results showed that advanced age, use of central venous catheter, low BMI, low PA, and combined diabetes were risk factors for short-term death in MHD patients ($P < 0.05$). **Conclusion:** The primary disease of elderly MHD patients dying in the short term is mainly diabetic nephropathy, and the cause of death is the cause of cardiovascular disease. Early effective control of blood glucose and blood pressure, improved nutritional status, reasonable selection of vascular access, active prevention and treatment of cardiovascular disease and infection complications, which is helpful to prolong the survival time of elderly MHD patients.

Keywords

Maintenance haemodialysis, end-stage kidney disease, elderly, diabetic kidney disease, early death, risk factors

One of the most important renal replacement modalities in patients with end-stage renal disease on maintenance hemodialysis (maintenance hemodialysis, MHD). With the continuous progress of hemodialysis technology, the quality of life of elderly patients with end-stage renal disease has been improved. However, the risk of death is still high, including some studies [1]. It shows that the case fatality rate reached 10% to 20% within 1 year. Due to elderly patients with complex diseases, have more complications, and poor tolerance of hemodialysis treatment, dialysis risk is greater, repeated hospitalization rate is high, and high mortality, therefore, the elderly MHD patients cause of death and risk factors to have enough understanding, to targeted to improve clinical treatment plan, give adequate preventive measures. In this study, the survival situation of the short-term (within 3~12 months) of the elderly MHD patients was analyzed, and the death risk factors were analyzed to provide a clinical reference.

1. Data and methods

1.1 General information

The clinical data of 45 elderly patients who started regular MHD treatment and died within 3 to 12 months in the Blood purification center of the Eastern Theater Command General Hospital from January 2015 to December 2022 were selected as the death group. In addition, 45 elderly patients treated with regular MHD in the same period of more than 12 months were selected as the control group.

1.2 Methods

Collect patient-related data: ① Investigate the cause of death of the dead patients, including cardiovascular and cerebrovascular events, infections, tumors (solid tumors and hematological malignancies), systemic failure, bleeding, respiratory failure, etc.; ② Basic clinical data: gender, age, primary disease, dialysis vascular access, whether with cardiovascular and cerebrovascular diseases, whether with diabetes; ③ Laboratory indicators; Hemoglobin (Hb), albumin (ALB), prealbumin (PA), parathyroid hormone (PTH), blood, calcium, blood phosphorus, calcium and phosphorus product, blood creatinine (Scr), (urea nitrogen BUN), total cholesterol (TC), triglyceride (TG), were collected when entering the MHD.

2. Results

2.1 Cause of death analysis of the death group

The mean time from hemodialysis initiation to death for the 45 patients in the death group was (9.04 ± 2.16) months. The primary cases were 19 (42.22%) diabetic nephropathy, 13 (28.89%) hypertensive renal damage, 6 (13.33%) chronic glomerulonephritis, 4 (8.89%) tumors, 1 (2.22%) obstructive nephropathy, and 3 (6.67%) IgA nephropathy. Cause of death: 21 (46.67%) causes of cardiovascular disease, ranking the first; 10 causes of infection (22.22%)

2.2 Comparison of general and clinical data in Group 2

Table 1. 2 Group comparison of general and clinical data

| project | Death group (n =45) | Control group (n =45) | t /X ² | P |
|-----------------------------|---|--------------------------|-------------------|--------|
| age | 78.24±6.84 | 72.51±7.17 | 3.880 | 0.000 |
| Gender (male / female) | 26/19 | 23/22 | 0.403 | 0.672 |
| BMI(kg/m ²) | 20.39±2.85 | 22.88±3.16 | -3.935 | 0.000 |
| compl | diabetes mellitus | 14(31.11) | 5.475 | 0.019 |
| | Cardiovascular and cerebrovascular diseases | 35(77.78) | 6.983 | 0.008 |
| | Diabetic nephropathy | 19(42.22) | 1.196 | 0.274 |
| | Hypertensive renal damage | 13(28.89) | 0.207 | 0.649 |
| The main primary disease | CG | 9(20.00) | 0.720 | 0.396 |
| | Type of vascular access (central venous catheter / arteriovenous fistula) | 28/17 | 10/35 | 14.757 |
| Scr (μmol /L) | 762.84±210.09 | 730.96±210.71 | 0.719 | 0.474 |
| BUN (mmo /L) | 30.62±9.29 | 28.76±7.83 | 1.031 | 0.305 |
| ALB(g/L) | .8337±4.00 | 36.33±4.01 | -2.922 | 0.004 |
| PA(g/L) | 0.22±0.04 | 0.27±0.05 | -6.120 | 0.000 |
| Hb (g/L) | 85.49±14.90 | 93.71±15.19 | -2.592 | 0.011 |
| TC (mmol /L) | 3.88±0.55 | 4.15±0.64 | -2.105 | 0.038 |
| TG (mmol /L) | 1.37±0.10 | 1.40±0.08 | -1.806 | 0.074 |
| Blood calcium (mmol / L) | 2.09±0.25 | 2.00±0.21 | 1.815 | 0.073 |
| Blood phosphorus (mmol / L) | 2.19±0.37 | 1.83±0.30 | 5.062 | 0.000 |
| calcium-phosphorus product | 53.78±3.52 | 52.44±4.80 | 1.504 | 0.136 |
| PTH (pg /mL) | 198.02±80.50 | 245.47±81.72 | -2.775 | 0.007 |

2.3 Factor analysis of short-term death in elderly patients with MHD

Table 2. Logistic regression factor analysis of short-term deaths in elderly MHD patients

| metric | B | S.E. | Wald | P | Exp (B) | 95CI |
|-------------------|--------|-------|--------|-------|---------|--------------|
| age | 6.902 | 1.687 | 16.747 | 0.000 | 1.205 | 1.015~10.572 |
| BMI | -3.253 | 0.858 | 14.364 | 0.000 | 1.114 | 1.007~7.208 |
| Vascular access | -1.641 | 0.670 | 5.991 | 0.014 | 1.822 | 1~6.052.721 |
| PA | -2.541 | 0.899 | 7.988 | 0.005 | 0.215 | 0.020~0.796 |
| diabetes mellitus | -2.130 | 0.890 | 5.721 | 0.017 | 1.723 | 1.143~10.592 |

3. Discussion

With the growth of age, the kidney structure and function of the elderly change by aging, the kidney reserve function decreases, and the susceptibility to various kidney injuries increases, leading to a significant increase in the incidence of kidney disease, and elderly patients requiring MHD also increase. Elderly patients have poor function of various organs, poor compensatory ability and immune system function, and poor nutritional conditions, so their prognosis, survival time, and quality of life are worse than those of the general population [2].

The mean time from hemodialysis start to death of the 45 deceased patients included in this study was (9.04 ± 2.16) months, which is similar to the results of several centers in the country [3-5]. 45 cases in the central disease is diabetic nephropathy (42.22%), followed by hypertensive renal damage (28.89%), chronic glomerulonephritis (13.33%), which suggests that diabetic nephropathy is the primary cause of elderly patients with end-stage renal disease, analysis may be related to the domestic elderly population diabetes higher than young people (55.56% of patients in this group for diabetic nephropathy or nephropathy with diabetes), and diabetic nephropathy patients with cardiovascular and other complications earlier and earlier into hemodialysis treatment [6]. The analysis of the causes of death showed that the causes of cardiovascular disease accounted for 46.67%, ranking first, followed by the cause of infection, accounting for 22.22%. Cardiovascular disease is the first cause of death, which is in line with the results of several domestic studies [3-5, 7]. This study [8] showed that the risk of death from cardiovascular disease was 10 to 20 times higher than that of the general population. In addition, hemodialysis treatment itself is easy to causes complications such as blood pressure change, anemia, ischemic heart disease, etc., which can lead to left ventricular hypertrophy, which is an important risk factor indicating death of cardiovascular disease [9]. In addition, patients treated on hemodialysis often have blood volume and potassium accumulation, and have a higher risk of arrhythmia and cardiac arrest, leading to an increased risk of cardiovascular mortality [10]. Fox class [11], it is also proposed that diabetes can increase the total and cardiovascular mortality by 1.2 to 1.9 times. In this study, 55.56% of the elderly patients had diabetes, and 77.78% of the patients had cardiovascular and cerebrovascular diseases, which could explain that cardiovascular disease was the first cause of death. Infection is the second cause of death, which is related to the low immune function of MHD patients, prone to complicated infectious diseases, and the rapid aggravation of the disease after bacterial infection [12]. The analysis of the original causes of disease and death suggests that clinical attention should be paid to the health management of elderly patients with early diabetic nephropathy, delay the development of diabetic nephropathy to the end stage as much as possible, and reducing the mortality of MHD patients in the short term should focus on the control of cardiovascular and cerebrovascular complications and infection.

In this study, elderly patients with regular MHD and survival longer than 12 months were selected for univariate and multivariate analysis. In univariate analysis, age, combined diabetes, combined cardiovascular and cerebrovascular diseases, vascular access type, and blood phosphorus levels were associated with short-term death in elderly patients with MHD. Advanced age is an important risk factor for short-term death of hemodialysis patients. In the process of aging, the immunity and tolerance of treatment are gradually declining, the absorption capacity of nutrition is gradually declining, and vascular sclerosis and compliance change lead to the increase of volume load and left ventricular hypertrophy, which increases the risk of death of elderly patients [12]. In this study, elderly patients were classified as 60 to 74 years and 75 years and above, and the results showed that the risk of death 75 years and above was significantly higher than that of 60 to 74 years. Diabetes and hypertension are important causes of cardiovascular diseases in elderly patients, which can cause damage to multiple target organs such as the heart, brain, and kidney. Combined with diabetes cardiovascular and cerebrovascular diseases are important factors affecting the death of cardiovascular and cerebrovascular diseases in elderly hemodialysis patients. The results of the multivariate

analysis in this study also showed that combined diabetes is a risk factor for short-term mortality in older patients with MHD. The types of vascular access in hemodialysis patients are divided into central venous catheter and arteriovenous fistula. The use of central venous catheters for hemodialysis is prone to complications such as infection, ectopic catheter tip, thrombosis, and fibrin sheath formation, which increases the risk of death [13]. In clinical practice, cases of the central venous catheter are generally based on the poor vascular conditions of the fistula, diabetes, advanced age, and malignancy, which differ in the selection of patients themselves, leading to a higher risk of death in this group. This study compared the death group with the control group and found that the blood phosphorus level of the death group was significantly higher than that of the control group.

In conclusion, the main causes of death in elderly individuals with MHD in the short term are diabetic nephropathy and hypertensive renal damage. The main causes of death are cardiovascular disease and infection, and numerous factors affect the prognosis of patients. Old age, the use of central venous catheters, low BMI, low physical activity (PA), and comorbid diabetes are all associated with patient mortality. Early and effective control of blood glucose and blood pressure, improvement of nutritional status, rational selection of vascular access, and active prevention and treatment of complications such as cardiovascular diseases and infections can help prolong the survival time of elderly patients with end-stage renal disease undergoing maintenance hemodialysis (MHD).

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