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Hemodialysis Therapy and Common Complications in the Department of Nephrology

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Abstract: With the increasing incidence of kidney disease, the society pays more and more attention to its treatment. As a common method of kidney disease treatment, hemodialysis has been widely used in the clinical treatment of nephrology. In the stage of dialysis, it is very easy to have all kinds of complications, which will threaten the life of patients. The purpose of this paper is to improve the therapeutic effect by analyzing the common complications of hemodialysis in the department of nephrology. In this paper, the principle and concept of hemodialysis and common diseases in nephrology department were discussed at first. Then, by means of case retrospective analysis, the specific types of common complications in hemodialysis in nephrology department were analyzed, and the specific treatment plans for each complication were proposed. The experimental results showed that: compared with before the treatment of complications, after the treatment of complications, the patient's life risk decreased by about 28%, the treatment effect increased by about 20%, and the recovery rate increased by about 6%. In summary, the timely treatment of complications is related to the therapeutic effect of hemodialysis.

1. Introduction

In recent years, with the increasing incidence of kidney diseases, these diseases have become an important disease threatening human life and health. Hemodialysis is a relatively effective method in the treatment of kidney disease. But, because of the particularity of hemodialysis treatment, after the treatment usually appear kinds of complications, complications appear not only seriously affect the final effect of hemodialysis treatment, also a serious threat to the life safety of patients, so the complications timely scientific processing is very necessary, therefore, need for different complications situation, find out targeted treatment, the maximum to reduce complications of the clinical treatment and follow-up of patients with the ill effects of rehabilitation.

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Due to the multiple and dangerous nature of kidney disease, it has been widely concerned by all sectors of society. Domestic and foreign scholars have conducted a series of studies on the treatment of kidney disease, and achieved certain research results [1]. In literature [2], the author mainly studied the inducing factors of kidney disease from four perspectives: lifestyle, psychological factors, drug treatment and disease infection. In literature [3], on the basis of retrospective analysis of cases, the author analyzed the common complications of diabetic nephropathy hemodialysis, including hypertension, hypotension and cardiovascular and cerebrovascular accidents. In the literature [4], the author focused on the main causes of various complications of hemodialysis, and on this basis proposed specific treatment strategies for different complications. In literature [5], combined with relevant research data, the author focused on the rational application of drug treatment in kidney disease, and made a detailed explanation of the specific use of various drugs.

In order to ensure the timely and effective treatment of the common complications in hemodialysis in the department of nephrology, promote the continuous improvement of the therapeutic effect, and provide guarantee for the life of patients to the maximum extent [6]. In this paper, the principle and concept of hemodialysis and common diseases in the department of nephrology were discussed at first. Then, by means of case retrospective analysis, the specific types of common complications in the department of nephrology hemodialysis were analyzed, and specific treatment plans for each complication were proposed [7]. The study in this paper not only promoted the understanding and treatment of common complications in hemodialysis in the department of nephrology, but also laid a theoretical foundation for subsequent studies in related aspects [8].

2. Related Concepts

2.1. Hemodialysis

Hemodialysis, short for "HD", is one of the main methods of renal replacement for patients with acute and chronic renal failure at the present stage [9]. Hemodialysis through blood drainage, the blood through a myriad of hollow fiber dialyser drainage to the human body in vitro, then similar with human body blood concentration of dialysate in hollow fiber inside and outside, with the help of filtration, adsorption, diffusion and convection exchange of material, so as to realize the effective removal of metabolic waste within the body, make human body internal electrolytes and acid-base level maintained at a relatively balanced state; In addition, hemodialysis can also effectively remove excess water in the body, and eventually return the purified blood to the human body. This whole process is called hemodialysis [10].

The working principle of hemodialysis includes solute transport and water operation. Solute transport includes three steps: dispersion, convection and adsorption. Dispersion is a key mechanism for solute clearance during hemodialysis [11]. On the basis of concentration gradient, solute is transferred from high concentration to low concentration gradually. This phenomenon is defined as dispersion. The irregular movement of solute molecules and particles is the main source of dispersion of solute. The solute and solvent move through the semi-permeable membrane together, which is defined as convection [12]. Convection is not affected by the molecular mass of the solute and the difference in the concentration gradient. The pressure difference between the two sides of the membrane is the driving force for the formation of the transmembrane, in other words, the traction of solute. Some harmful substances or proteins in the blood are selectively absorbed by the attraction of positive and negative charges to each other and by the hydrophilic genes on the surface of the dialysis membrane, a process called adsorption. Negative charge is found on all the surface of dialysis membrane, and the amount of heterocharge protein absorbed by dialysis

membrane is directly determined by the amount of negative charge on the surface of dialysis membrane. During hemodialysis, the dialysis membrane can selectively absorb some abnormal proteins, harmful substances and drugs in the blood, so as to remove pathogenic substances and achieve effective treatment for patients. Ultrafiltration is the key to water transport. Based on the pure water or osmotic pressure gradient, the liquid can successfully move through the semi-permeable membrane, a process known as ultrafiltration. During hemodialysis, the movement of water from one side of the blood to the other side of the dialysate is called ultrafiltration. Conversely, if water moves from one side of the dialysate to the other side of the blood, the phenomenon becomes anti-ultrafiltration. Water purification and osmotic pressure gradient transmembrane pressure and ultrafiltration coefficient are the four main factors that influence ultrafiltration.

The application of hemodialysis in clinical treatment is characterized by many diseases, among which the most common ones include acute kidney injury, chronic kidney failure, uremia, metabolic acidosis, drug poisoning and food poisoning. It must be emphasized that not all patients can undergo hemodialysis. Patients with intracranial hemorrhage, shock, mental disorders to a certain extent or cardiomyopathy cannot undergo hemodialysis. In the above cases, hemodialysis will pose a serious threat to patients' lives. Dialyzer, water treatment system, dialyzer and dialysate are the main components of hemodialysis system. Blood dialyzer is widely used in the treatment of blood purification. Water treatment system is mainly used for the treatment of harmful substances in the water in the blood. Dialyzer, also known as artificial kidney, is a key part of the hemodialysis system. During dialysis, the blood flows in reverse through the hollow fibers, and the dialysate carries some small molecules of solute through the holes in the hollow fibers for material exchange. All kinds of harmful substances in the blood are effectively removed by dialysate through exchange. Dialysate is by dialysis concentrate and anti-seepage under a certain proportion of blending diluting, it contains the basic electrolyte concentration and the concentration of electrolytes in the blood, can not only make the body in the electrolyte is always maintained at a relatively normal level, can also with the aid of high concentrations of bases for the body, helping patients to correct acidosis.

2.2. Introduction of Renal Diseases

The department of nephrology mainly deals with kidney diseases. In recent years, the number of patients with kidney disease has been increasing year by year all over the world. Kidney disease has developed into a common and multiple disease that seriously threatens the safety of human life. Kidney disease has developed into uremia, which seriously threatens the safety of human life. At present, chronic kidney disease (CKD) has developed into a common major disease threatening human life after cardiovascular disease, tumor and diabetes, and has become a global public health problem. The common diseases in nephrology department mainly include acute, chronic and acute glomerulonephritis, renal failure and nephrotic syndrome. Generally speaking, renal replacement therapy is an effective way to treat renal diseases. The common treatment methods include kidney transplantation, hemodialysis and peritoneal dialysis. At the present stage, most experts believe that there are many factors leading to the occurrence of renal diseases, such as poor lifestyle habits, drug abuse and viral infection. The research of some scholars also shows that from several aspects such as strengthening physique, preventing infection, working and sleeping, diet, taking medicine and mental state, it can play a certain role in preventing kidney diseases.

3. Retrospective Case Analysis Experiment

Cases in this paper, with the help of the experiment of renal medicine were retrospectively studied study the situation of the complications in patients receiving hemodialysis, research object

from a region of a 3 armour hospital in 2018-2019 were a total of 50 renal medicine of hemodialysis patients, kinds of complications in these patients, complications, the reason and the specific way of dealing with the complications are carried on the thorough analysis of the experimental steps are as follows:

(1) Basic data of the research object

The 50 patients were treated with hemodialysis in the department of nephrology of a first-class third-class hospital in 2018-2019. The 50 patients were aged between 42 and 83 years old, with an average age of 68.52 years old. Among them, 38 were male patients and 12 were female patients. The course of kidney disease of patients ranged from 1 to 9 years, and the number of dialysis patients ranged from 3 to 39. The average number of dialysis patients was 17, so the total number of dialysis patients was 1492. The hospital carries out imaging and laboratory tests on the patients, based on the results of the two tests, the final diagnosis of the patients' disease is made. Hypertension, proteinuria and decreased urine volume were the clinical manifestations of the 50 patients in the study. This study was conducted with the approval of the ethics committee of the grade iii first-class hospital. All the patients involved in the analysis of the experiment signed the consent of the experiment on a voluntary basis.

(2) Acquisition of original data

To ensure the accuracy of data in this paper, we study and scientific research results, the author first reviewed ten thousand square, hownet and VIP site related literature data, collected blood dialysis related research literature, a total of 56 were collected from the aspects of the relevant literature, then the data and conclusions of the literature has carried on the detailed classification and sorting. These existing research data provide sufficient data support for the experimental study of this paper, which is conducive to ensuring the scientificity and accuracy of the retrospective analysis experiment of cases in this paper. In addition, to further grasp the complications of renal medicine blood dialysis patients condition and related complications of treatment, the author also through online survey and site query in a way that relevant data investigation, questionnaire survey is the main object of renal medicine doctors and scholars, and the content of the questionnaire including hemodialysis risk, type of complications and the treatment of complications, etc. In this paper, a total of 300 questionnaires were issued, and 287 valid questionnaires were eventually recovered. In addition, the author also logged on the relevant data of China's health department and stood on my station to query and record the data related to the complications of hemodialysis patients in China in recent years. These data together constitute the original data of the experimental research in this paper, which is the first-hand data.

(3) Treatment and evaluation methods

There are two main ways to establish vascular access for hemodialysis, which are arteriovenous external fistula in the upper extremity and subclavian vein double cavity catheter. The hemodialysis apparatus of 50 patients were all dialyzed with the help of fresenius type 2008A or 4008B machines and reverse osmosis dialyzer instruments. The total area of the dialysis membrane of the dialysis apparatus was 1.2 m2, and the dialysis was performed with bicarbonate. The blood flow was between 200 and 280ml/L, and the dialysis fluid flow was between 500 and 600mL/min. Because every patient, there are many differences between the specific use of insulin, as a result, the use of insulin are usually based on patients' weight to determine the general insulin dosage is 0.5 mg/kg for the first time, the patient if bleeding tendency, in body, reduce the drug use, should be obvious bleeding of patients to ban the use of these drugs. Then, the disease was counted. With the help of the detailed statistics of the complications in the patients' hemodialysis treatment, the specific manifestations of the complications and the relevant treatment methods were analyzed. The experimental data in this paper is based on the final statistical data of complications in the department of nephrology of the Chinese medical association, and it is also the scientific reference

for the treatment of complications in this paper. Finally, the comprehensive efficacy of hemodialysis was evaluated. The treatment of patients is carried out with the help of hemodialysis apparatus and the working principles of dispersion and convection, so as to realize the exchange of substances in the blood and effectively remove all kinds of metabolic wastes in the blood, so as to ensure that the levels of acid, base and electrolyte in the body of patients are maintained within a relatively stable range. Seven days after the end of hemodialysis, the patients were followed up for a detailed statistical analysis of the therapeutic effects of various complications, and the differences in the changes of specific symptoms before and after the treatment of complications were compared and analyzed.

(4) Target patients

The specific conditions of patients in hemodialysis were observed, especially the actual clinical conditions of common complications such as headache, nausea, muscle spasm, external circulation and coagulation, and dialysis membrane rupture, and the relevant clinical data were recorded in detail.

(5) Statistical analysis of experimental data

After the above experiments are completed, the obtained experimental data are statistically analyzed in detail with the help of SPSS statistical analysis software, and then relevant data charts are drawn on the basis of statistical analysis with the help of computer data drawing software. On the basis of in-depth analysis of data charts, accurate experimental conclusions are drawn.

4. Analysis of Complications of Hemodialysis Treatment

4.1. Experimental Results

Through the above case retrospective analysis experiment, the author obtained the following experimental data. The specific experimental data are shown in Figure 1, Table 1 and Figure 2. The data in the chart are the results of the author's experimental investigation.

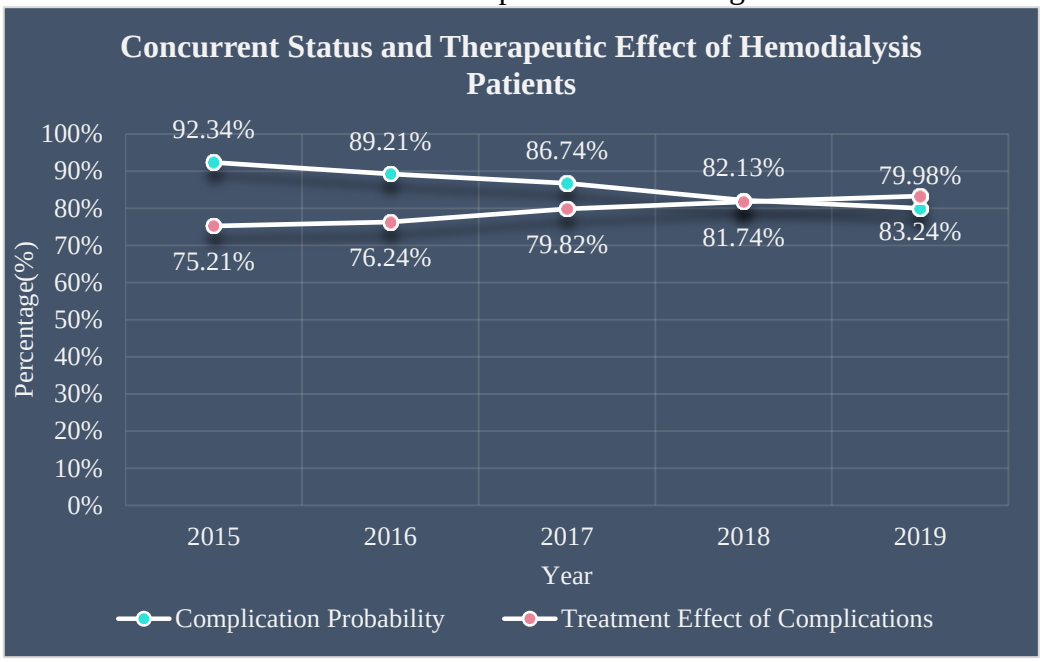

Figure 1. Concurrent status and therapeutic effect of hemodialysis patients in China in recent years

Figure 1 is the basic situation of overall complications of hemodialysis patients in China in

recent years and the data related to the overall treatment effect of complications. From the data in Figure 1, we can see that the probability of complications in hemodialysis in China gradually decreased from 92.34% in 2015 to 79.98 in 2019. There are many reasons for the decrease of complications, such as the improvement of hemodialysis equipment technology and the improvement of nursing methods before dialysis. In addition, the data in the figure shows that the treatment effect of complications in Chinese hemodialysis patients showed a trend of gradual increase from 75.21% in 2015 to 83.24% in 2019, indicating that the treatment effect of complications in Chinese hemodialysis patients has achieved good results at the present stage. However, in order to further reduce the risk of complications to patients with renal disease, further efforts are needed to improve the therapeutic effect.

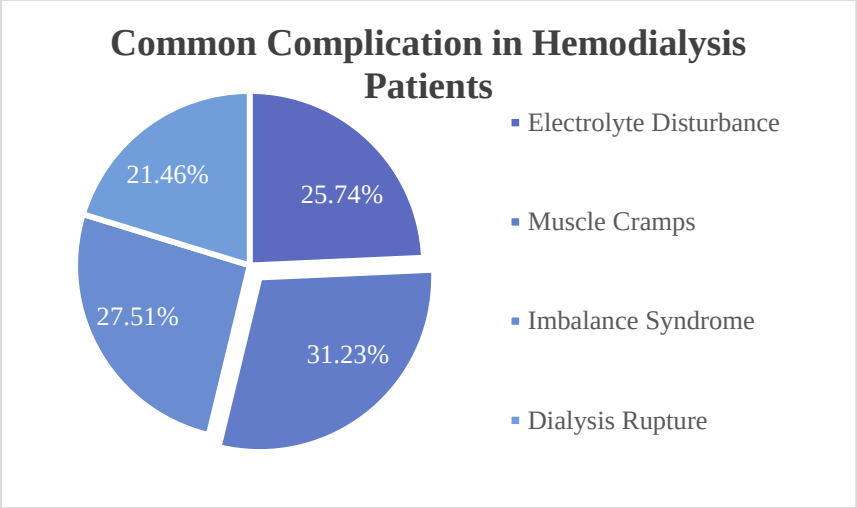

Figure 2. Common complications in hemodialysis patients

Table 1. Comparison of complications of hemodialysis patients before and after treatment in this study

Time	Have a headache	Vomiting	Nausea	Muscle cramps
Before the treatment	15	20	32	49
After treatment	3	2	2	1
Time	Low blood pressure	Blood coagulation	Dialysis rupture	/
Before the treatment	13	42	40	/
After treatment	2	2	3	/
*Data were derived from the results of an experimental survey				

Figure 2 for the present stage our country common complications in patients receiving hemodialysis types, from Figure 2 data can see, kidney disease patients with complications during hemodialysis therapy type varies, mainly including electrolyte disorder, dialysis membrane rupture, muscle spasms and imbalance syndrome types, including imbalance syndrome mainly including dizziness, nausea and retching concreteness symptom; Table 1 is the choice of 50 subjects of complications in hemodialysis treatment types of specific conditions, from the data in the table can see, in 50 patients with complications types mainly include headache, vomiting, nausea, muscle spasms, low blood pressure, blood clotting and dialysis membrane rupture, 7 kinds of complications of their respective cases respectively, 49, 13, 15, 20, 32, 42, 40; After the treatment of related complications, the cases of complications mentioned above were 3, 2, 2, 1, 2, 2 and 3, respectively. By comparing the data before and after treatment, we can find that after timely treatment of

complications, the rate of complications in hemodialysis patients is greatly reduced, which also proves that targeted and timely treatment plays an important role in improving the treatment effect of complications.

4.2. Discussion on the Types of Common Complications and Treatment Plans

For now, the technology of diagnosis and treatment of renal medicine overall has been significantly improve, with the help of the rationality of the complications in the process of hemodialysis treatment condition analysis, not only can realize the recovery stage of kidney disease in patients with reasonable and effective control of the specificity of disease states, promote the improving of the overall treatment effect. In recent years, the incidence of kidney disease in China is also on the rise. Hemodialysis in kidney disease treatment, one of the most common renal alternative treatments to patients' blood drainage with related instrument, and the body on the basis of the principle of diffusion and convection of material quickly fandy, so as to achieve the patient's body and metabolic waste effectively remove harmful substances, so as to make the patient inside the acid-base value and electrolyte level is always maintained at a relatively balanced state. In this paper, with the aid of of a 3 armour hospital of 50 patients with hemodialysis retrospective case analysis shows that at present the main complications in renal medicine hemodialysis types including dialysis membrane rupture, muscle cramps, dizziness and nausea disease syndrome, and low blood pressure, etc., and in the above-mentioned complications after timely treatment, patients with renal medicine kidney disease of the probability of all kinds of complications have been effectively reduced. In the following, the author will introduce the types of common complications in hemodialysis treatment and their treatment methods:

(1) Dialysis membrane ruptures

As mentioned above, dialysis membrane is a kind of separation membrane driven by concentration difference. On the basis of the concrete particle size of solute separated, the dialysis membrane needs to have small pores with uniform pore size corresponding to it. Dialysis membrane rupture often occurs in patients undergoing hemodialysis. Once the dialysis membrane rupture occurs, it will affect the normal hemodialysis process of patients. If it cannot be treated in time, it will pose a threat to the life of patients to a certain extent. The reasons for the rupture of dialysis membrane are comprehensive, such as the quality of the equipment, improper cleaning water pressure, and large amount of water loss per unit time. First of all, the prevention of dialysis membrane rupture should be carried out to minimize the probability of this situation. For this purpose, the following must be done: first, before dialysis, instrument detection; Second, the water loss should be kept within the normal range. Thirdly, the basic principles of instrument reuse should be strictly observed. Fourthly, the instrument should be tested regularly. In the process of dialysis, once the symptoms of dialysis membrane rupture, must be treated in a timely manner. First of all, the venous and arterial ends in the dialysis pipeline should be clipped in a timely manner, the blood in the extracorporeal circulation should be discarded, the dialysis loop and dialysis should be replaced together, and then the patient's hemodialysis treatment should be continued. In the process of replacement, the specific life indicators of patients with kidney disease should be closely monitored at all times. In case of hemolysis or fever, the corresponding scientific treatment should be carried out in a timely manner.

(2)Imbalance syndrome

In this study, the main symptoms of imbalance syndrome were dizziness and vomiting. The complications usually occurred in the middle or early stage of hemodialysis. In a short period of time, the patients with severe imbalance syndrome would also suffer from visual loss, coma and consciousness disorders. Hemodialysis makes analysis of all sorts of small material such as the

human body in the blood urea nitrogen was removed with the quickest speed, greatly reduces the existing in the plasma osmotic pressure, but at this time also failed to completely remove blood vessels tissue and cells within the urea nitrogen, is higher than the plasma osmotic pressure in this time, water also gradually transferred to the organization and from inside the plasma cells. In this state, the possibility of central nervous system edema is high, increased intracranial pressure can cause headache, nausea and consciousness disorders. Once the imbalance syndrome appears, the vital signs of hemodialysis patients must be strictly monitored and observed. A series of operations such as oxygen inhalation and blood pressure detection should be carried out on the patients to reduce the negative pressure of ultrafiltration to a certain extent and constantly reduce the rate of urea nitrogen decline after hemodialysis. In addition, the symptoms can be alleviated with medication, such as injections of hypertonic glucose and diazepam. Patients with more severe symptoms should immediately stop hemodialysis and undergo some treatment. Patients undergoing hemodialysis for the first time should constantly slow down the blood flow speed, appropriately shorten the dialysis time, and the dialyzer should be used in a small area to minimize the probability of imbalance syndrome. Figure 3 shows the comparison of the risks of hemodialysis patients before and after the occurrence of imbalance syndrome. The data in Figure 3 shows that, with the passage of time of hemodialysis, the life risks of patients after the occurrence of imbalance syndrome are significantly higher than before the occurrence of imbalance syndrome. This indicates that imbalance syndrome poses a threat to the life safety of hemodialysis patients to a large extent, which requires timely and correct treatment.

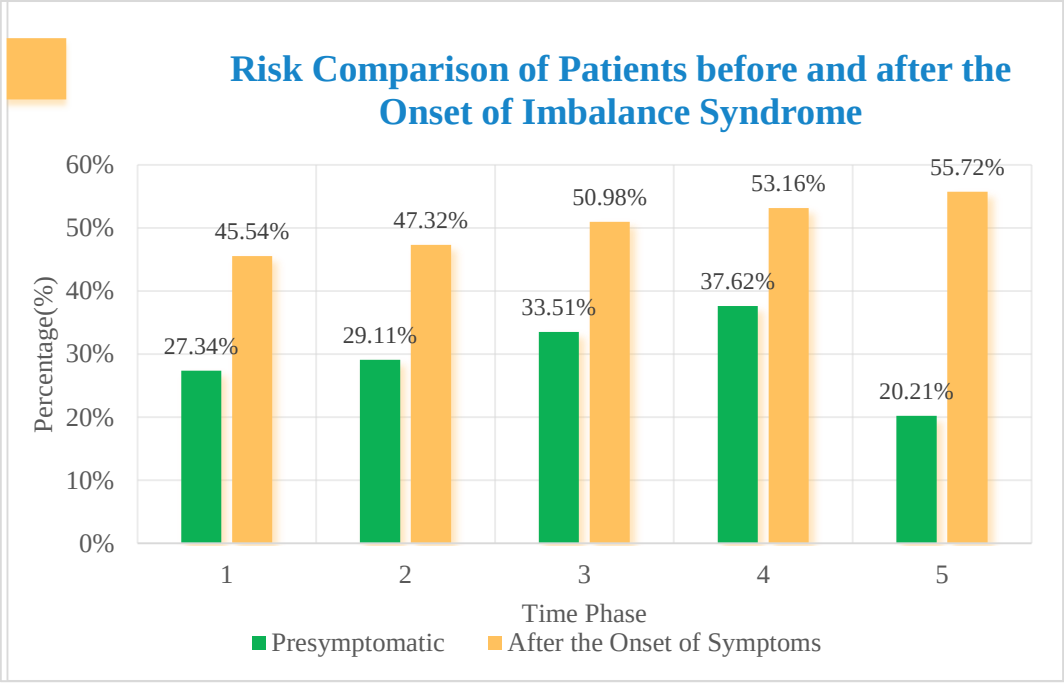

Figure 3. Comparison of risk of patients before and after the occurrence of imbalance syndrome

(3) Muscle spasms

As can be seen from the above experimental data, some hemodialysis patients will be in a state of forced contraction of local muscles during or after dialysis, accompanied by severe pain. Generally speaking, muscle spasm is easy to occur in the middle and late stage of hemodialysis, which is a sudden complication in nature. The appearance of muscle spasm may impair the basic function of muscle tissue to a large extent. The causes of muscle spasm are as follows: the

dehydration rate of the human body is constantly accelerated in the process of hemodialysis. When the amount of water is too large, the effective circulating blood volume will be in a state of insufficient, thus unable to provide adequate blood supply to the muscles, resulting in the complications of muscle spasm. In addition, dialysis hypotension, low Blood sugar, rapid ultrafiltration and electrolyte disturbances are all possible causes of muscle spasms. Muscle spasm often occurs in the lower extremities of the body, and generally lasts about 10 minutes. Once muscle spasm occurs, we should first explore the specific reasons for its occurrence and take corresponding measures according to the specific reasons. The specific treatment measures are as follows: first, relief with medication, such as injection of normal saline or glucose; Secondly, the site of muscle spasm should be continuously massaged to relieve the pain caused by muscle spasm. Thirdly, the ultrafiltration velocity should be controlled within a reasonable range.

(4) Hypotension

Hypotension is also a common complication during hemodialysis, and its occurrence rate is in the forefront. Current studies indicate that the main causes of hypotension complications during dialysis are as follows: first, lack of effective blood volume; Second, the ultrafiltration speed is too fast or the quantity is too large; Third, the patient's autonomic nerve function appears some degree disorder; Fourth, circulatory function is unstable. Elderly hemodialysis patients are a high incidence of hypotension complications. The management of hypotension complications should be handled according to the different causes. First, during hemodialysis, patients' blood pressure should be strictly detected and monitored, and patients' pulse should be observed. Secondly, the amount of ultrafiltration should be strictly controlled. In general, the amount of ultrafiltration per time should not be higher than the weight difference between the two times of hemodialysis. Thirdly, to promote the continuous improvement of blood osmotic pressure, dialysate containing 140-142mol/L can be used to improve osmotic pressure. Fourth, when the blood pressure is in the acute state, the compound sodium lactate (equilibrium solution) should be injected rapidly by intravenous drip from 250 to 500. Fifth, the rational use of antihypertensive drugs, before hemodialysis to stop the use of antihypertensive drugs; Sixth, to promote the continuous improvement of dialysis methods, alternating the use of hemodialysis and hemodiafiltration. If the patient's blood pressure is still low after the above treatment, antihypertensive drugs can be used according to the actual situation.

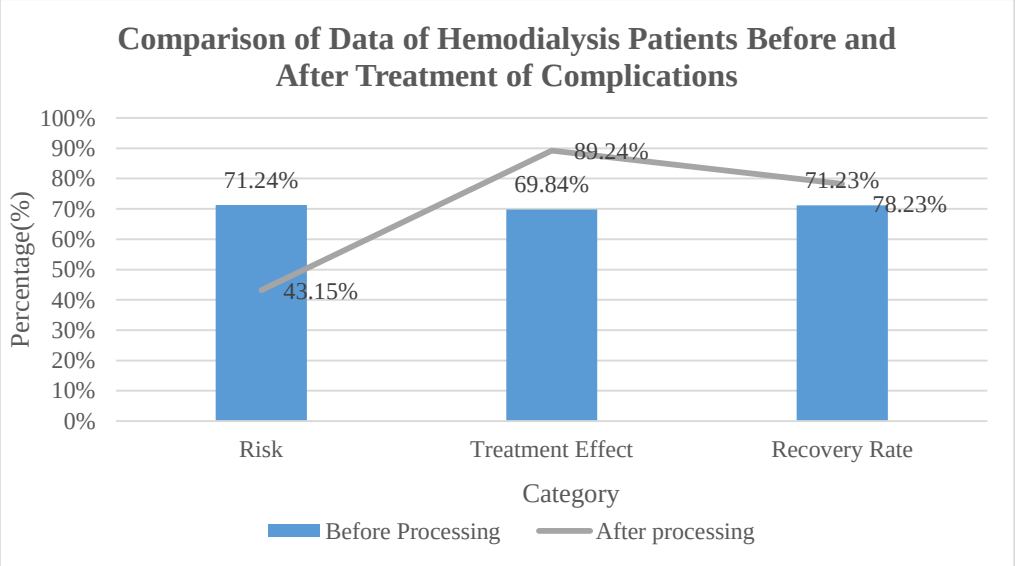

Figure 4. Comparison of data of hemodialysis patients before and after the treatment of complications

Figure 4 handle hemodialysis patients before and after treatment for complications of comparison and analysis of data, data from the data in Figure 4 can see, compared with the complications of treatment before, to deal with complications after life risk dropped by about 28% of patients, treatment effect is improved by about 20%, recovery rate increased by about 6%, thus the timely treatment of complications is related to the therapeutic effect of hemodialysis. To sum up, we have taken active measures to prevent and treat the types of complications that may occur in hemodialysis, so as to maximize the role and effect of hemodialysis and promote the continuous improvement of patients' quality of life.

5. Conclusion

In this paper, by means of case retrospective analysis experiment, the complication types of patients in hemodialysis treatment were analyzed in depth, and the treatment scheme of each type of complication was explained. The research in this paper not only promotes the continuous improvement of the function and effect of hemodialysis, guarantees the life safety of patients, but also lays a theoretical foundation for the development of related researches in the future. This paper draws the following conclusions through research:

(1) The common types of complications in hemodialysis include imbalance syndrome, electrolyte disturbance, hypotension, dialysis membrane rupture and muscle spasm, etc. Each type of complication corresponds to different treatment methods;

(2) Compared with before the treatment of complications, after the treatment of complications, the patient's life risk was significantly reduced, and the treatment effect and recovery rate were significantly improved. Active prevention and management of the possible complications in hemodialysis plays an important role in the treatment of hemodialysis.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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