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Clinical Treatment of Pulmonary Infection Complicated with Severe Hypokalemia in Senile Inpatients with Cardiovascular Diseases

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ABSTRACT:

Objective To discuss the clinical treatment and curing measures for pulmonary infection complicated with severe hypokalemia in senile inpatients with cardiovascular diseases for the sake of improving the diagnosis and treatment level. Methods Clinical data of 68 senile inpatients with cardiovascular diseases who suffered from pulmonary infection complicated with severe hypokalemia collected from March, 2012 to February, 2015 were investigated and the patients were randomly divided into the control group and the observation group, 34 cases in each group. The observation group was given potassium chloride solution for supplementary treatment for potassium injected by micro pump through deep vein catheterization, while the control group was given 0.3% of potassium chloride solution for supplementary treatment for potassium by common intravenous infusion. Then the clinical effects, the improvement conditions of pulmonary infection and levels of serum potassium of patients in two groups were compared after the treatment. Results The effective rate of the observation group was 88.24% which was significantly higher than 67.65% of the control group (P<0.05). The levels of serum potassium before and after treatment were (2.18±0.15) mmol/L and (3.98±0.42) mmol/L in the observation group, and the levels of serum potassium before and after treatment were (2.46±0.15) mmol/L and (3.51±0.38)mmol/L in the control group. Obviously, the levels of serum potassium in observation group were higher than the levels in the control group and the differences between the two groups had statistical significance (P<0.05). Conclusion: The supplementary treatment for potassium operated by deep venous catheter and the treatment of potassium chloride solution injected by subclavian vein puncture can promote the effective rates of the treatment for pulmonary infection complicated with severe hypokalemia in senile inpatients with cardiovascular diseases, improve the quality of life of patients and be popularized and applied in the clinical treatment.

Keywords: *Senile patients with cardiovascular diseases; pulmonary infection; severe hypokalemia*

INTRODUCTION

That senile patients get infected in the hospitals attracts much attention in recent years.The most common infection is pulmonary infection[1], which has a strong impact on the quality of life of patients[2]. Severe hypokalemia is a kind of disease that is caused by the rapid declining of the concentration of serum potassium[3]. The severe hypokalemia may cause much adverse reactions, and if patients can not be promptly treated, they maybe lose their lives when the infection or the severe hypokalemia occurs. The author has treated and studied the pulmonary infection complicated with severe hypokalemia in senile inpatients with cardiovascular diseases and has achieved remarkable effect. The research results are reported in the following sections.

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MATERIAL AND METHOD

Clinical data

Data of 68 senile inpatients with cardiovascular diseases who suffered from pulmonary infection complicated with severe hypokalemia collected from March, 2012 to February, 2015 were chosen. Among the 68 senile inpatients, there were 32 male patients and 36 female patients. Their ages were between 24 and 78 years old and the average ages of them were 47±7.8 years old. The clinical symptoms of patients were chest distress, tachycardia, arrhythmia, numbness and lack of strength in lower limbs, and high pulse and respiratory frequencies. 31 cases were with history of hypertension, 9 cases were with history of chronic obstructive pulmonary disease, 13 cases were with history of diabetes and 15 cases were with history of heart disease complicated with cardiac insufficiency. Patients were randomly divided into the control group and the observation group, 34 cases in each group. The differences of clinical data between the two groups had no statistical significance, and the data of two groups had comparability.

Admittance and exclusion criteria

Admittance criteria:(1) patients who occurred respiratory symptoms like phlegm or excessive phlegm. (2) patients whose two lungs had rale. (3) patients who occurred fervescence and the temperature were above 37.3°C. (4) patients voluntarily signed the informed consent paper and took part in this experiment. Exclusion criteria: (1) The neutrophile granulocytes and leukocytes decreased which was caused by cytotoxic drugs. (2) patients were infected by acquired immune deficiency virus(HIV).

Diagnostic basis

By means of detecting the serum potassium of laboratory and examining the electrocardiogram and clinical symptoms of patients, the hypokalemia could be diagnosed. The specific conditions were the following: Slight hypokalemia meant that the content of serum potassium was between 3.0 and 3.5mmol/L; Medium hypokalemia meant that the content of serum potassium was between 2.5 and 3.0mmol/L; Severe hypokalemia meant that the content of serum potassium was less than 2.5mmol/L.

Therapeutic methods

The observation group

The supplementary treatment for potassium operated by deep venous catheter and the treatment of potassium chloride solution injected by subclavian vein puncture were adopted in the observation group.

With regard to the supplementary treatment for potassium operated by deep venous catheter, the puncture site was selected in the zone that the pulse of femoral artery in the medial side of right thigh was obvious. Before the puncture, the routine disinfection was arranged. And the potassium chloride solution was injected into the deep vein at the concentration of 30mmol/h after being diluted. When the concentration of serum potassium was more than 3.5mmol/L, patients were given the supplementary treatment for potassium by oral administration instead, and the dose was kept in 10g/d for 5d.

With regard to the treatment of potassium chloride solution injected by subclavian vein puncture, patients were arranged subclavian vein puncture, and the potassium chloride solution was diluted into the concentration of 0.4% by normal saline and then the micro pump was adopted to inject potassium chloride solution for supplementary treatment for potassium. When the concentration of serum potassium increased at the speed of 3.0mmol/L, patients were given the supplementary treatment for potassium by oral administration instead.

The control group

Patients were given 0.3% of potassium chloride solution for supplementary treatment for potassium by common intravenous infusion.

Table 1: The comparison of curative effect and the effective rate between the patients of two groups(%)

Curative effect	The control group(n=34)		The observation group(n=34)	
	Cases	%	Cases	%
Valid	23	67.65	30	88.24
Void	11	32.35	4	11.76

Table 2 The comparison of levels of serum potassium before and after the treatment between patients of two groups(mmol/L)

Groups	Before the treatment	After the treatment
The control group	2.46 ±0.15	3.51±0.38
The observation group	2.18±0.13	3.98±0.42

The specific collocation method was to add 15ml of potassium chloride solution whose concentration was 10% into 500ml of normal saline and keep the speed at 80 drop/min.

RESULTS

The curative effect of two groups

The effective rate of the observation group was 88.24%, while the effective rate of the control group was 67.65%. Apparently, the effective rate of the observation group was higher than the effective rate of the control group, and the differences between the two groups had statistical significance($P<0.05$)(See in Table 1).

The levels of serum potassium

After the treatment, the level of serum potassium of the observation group was obviously higher than the level of the control group, and the differences had statistical significance($P<0.05$) (See in Table 2).

The improvement of symptoms of pulmonary infection

The state of illness of patients gradually took a turn for the better. The symptoms of numbness of limbs and cyanosis on the face faded away, the pupil size returned to normal size, and the rale in two lungs vanished, and patients occasionally cough and had symptom of expectoration in the morning and night. The symptom of dyspnea vanished and patients kept having stable vital signs. The results of blood electrolyte examination, blood routine examination, hepatorenal functions examination showed the indexes were normal. In the meantime, the results of chest CT examination showed that the slight pleural effusion in the two lower lungs and the bilateral lungs had been absorbed, and after continue treatment in hospital for some time, patients completely recovered and left hospital.

DISCUSSION

The treatment compliance of senile inpatients with cardiovascular disease was poor, which made the treatment and prevention for the diseases more difficult. Pulmonary infection was a kind of nosocomial infections with higher morbidity. And the symptoms and sighs of pulmonary infection was not obvious and easy to influence the treatment[4]. The reason of pulmonary infection in senile patients with cardiovascular disease may be correlate to that antibacterial agents caused the diacrisis in pharyngeal section and influenced the protective barrier of respiratory system. Due to the particularity of factors of pulmonary infection, the pulmonary infection in senile patients with cardiovascular disease was

attached great importance. Hypokalemia was the common critical disease in clinical emergency treatment. Hypokalemia often was mixed with some primary diseases, therefore, the missed diagnosis and misdiagnosis easily occurred, which could have a strong impact on the treatment for patients and even threaten the lives of patients[5]. With regard to the salvage for patients with severe hypokalemia, the supplementary treatment for potassium shall be given under the observation of electrocardiograph monitoring, at the same time, the state of illness of patients should be paid close attention. The treatment for hypokalemia focused on the supplementary treatment for potassium. And the supplementary treatment for potassium should adopted venous mode, but the intravenous injection was strictly prohibited. And the speed should not be too fast and the dose could not be excessive[6]. Hypokalemia mainly presented disability of neurological functions and muscle functions. With the continuous runoff of potassium, the concentration of sodium ion and calcium ion in patients increased, which made the symptoms of hypokalemia more obvious. The diagnosis for hypokalemia mainly based on the concentration of potassium ion. When the concentration of potassium ion in patients was less than 3.5mmol/L, then the disease of patients would be diagnosed as hypokalemia[7]. Otherwise, patients may occur diarrhea, emesis, weakening of tendon reflex and other symptoms, and the electrocardiogram showed that T wave presented low and flat trend and the U wave occurred. The treatment for patients with severe hypokalemia should implement thesupplementary treatment for potassium under the observation of the electrocardiogram monitoring. With regard to the patients with serious state of illness, the speed and concentration of supplementing potassium should be increased, and the supplementary treatment for potassium should be arranged by venous supplement according to the principle of fast speed followed by slow speed and concentrated content followed by light content. The level of serum potassium should be monitored on time, and the dose of potassium should be adjusted at any time for the sake of preventing causing insufficiency of renal functions or the occurrence of hyperkalemia due to excessive supplement for potassium.

Therefore, the great vessels in vein were regarded as the first choice to arrange the supplementary treatment for potassium, and the dropping speed was strictly controlled. In addition, patients would be arranged the normal saline for the first choice during the process of fluid infusion due to the reason that glucose could replace the potassium ion. The study showed that the main etiological factor for the pulmonary infection in senile inpatients with cardiovascular disease was the application of antibacterial agents. Antibacterial agents caused the abnormal secretion of gland in pharyngeal section and influenced the protective barrier of respiratory system, thus caused the occurrence of infection[4,5]. By means of studying the data of pulmonary infection complicated with severe hypokalemia in senile inpatients, Guosheng Li, et al found that if the patients with hypokalemia did not get enough supplementary treatment for potassium in the early time, they may die. At the same time, those patients may also be arranged venous supplement for potassium and oral supplement. And that patients ate more food with high content of potassium would shorten the course of treatment and promote the recovery[6,7].

The great vessels in vein were adopted for supplementary treatment for potassium. The thick lumen had lower stimulation to the blood vessels and was not easy to cause the spasm, which made the transfusion more unobstructed. In the meanwhile, the above-mentioned application reduced damage of vascular wall caused by repeatedly punctures in common vein and the discomfort caused by the

stimulation to the small vessels, thus reduced patients' pain. During the process of venous supplement for potassium, more attention should be paid for observing if there were swelling, soreness, leakage, thrombogenesis and other adverse reactions found in the sites of venous catheterization and puncture. When the transfusion was obstructed, squeezing infusion tube was forbidden. The injection sites should be changed in necessity. Otherwise, medical staff should lift patients' injured limb and make it move, take magnesium sulfate or traditional Chinese medicine for partial hot compress and do the psychological counseling for patients for the sake of enhancing patients' confidence, making patients more cooperate with the treatment and making patients get well soon.

The results of this research showed that the effective rate of the observation group was 88.24% which was significantly higher than 67.65% of the control group, and the difference between the two groups had statistical significance($P<0.05$); After the treatment, the level of serum potassium of the observation group was apparently higher than the level of the control group, and the difference between two groups had statistical significance($P<0.05$).

CONCLUSION

To sum up, the supplementary treatment for potassium operated by deep venous catheter and the treatment of potassium chloride solution injected by subclavian vein puncture could promote the effective rates of the treatment for pulmonary infection complicated with severe hypokalemia in senile inpatients with cardiovascular diseases and improve the quality of life of patients

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