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Efficacy of Rituximab Combined with Plasma Exchange in the Treatment of Thrombotic Thrombocytopenic Purpura (TTP)

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Abstract: *Objective:* To analyze the curative effect of rituximab combined with plasma exchange in the treatment of thrombotic thrombocytopenic purpura. *Methods:* 70 patients with thrombotic thrombocytopenic purpura that were treated in our hospital from January 2022 to January 2023 were selected for this study. They were divided into two groups according the treatment method they were about to receive. The patients in the control group received plasma exchange. The observation group was given rituximab in addition to plasma exchange. Then, the therapeutic effects of the two groups were observed, and the incidence of adverse reactions was compared. *Results:* The rate of effectiveness of the treatment received in observation group and the control group was 97.14% and 82.86%, respectively. The treatment received in observation group had a better therapeutic effect ($P < 0.05$). The incidence of adverse reactions in the observation group (22.86%) was lower than that of the control group (5.71%) , with $P < 0.05$. *Conclusion:* Rituximab combined with plasma exchange is relatively more effective than plasma exchange alone, with less adverse reaction, making it a viable treatment option.

Keywords: Rituximab; Plasma exchange; Thrombotic thrombocytopenic purpura

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1. Introduction

Thrombotic thrombocytopenic purpura (TTP) is relatively common thrombotic microvascular disease. The clinical symptoms are mainly thrombocytopenia. Patients may also have fever, neuropsychiatric symptoms, etc., causing damage to the kidneys and other organs. The progression of the disease is relatively fast, and the mortality rate is relatively high [1]. Some studies have found that [2] if the patient fails to receive timely treatment, the mortality rate can reach 80–90%. The prognosis of traditional treatment methods for TTP is not satisfactory. With the continuous application of plasma exchange, the prognosis of this disease can be significantly improved, and the mortality rate can be controlled at 10% to 20%. While plasma exchange can provide a degree of therapeutic benefit for patients with TTP and contribute to improved prognoses, the disease still exhibits a relatively high recurrence rate. Therefore, additional research is necessary to explore alternative

treatment methods. The administration of rituximab in addition to plasma exchange can further reduce the recurrence rate of TTP and effectively relieve related symptoms, which has clinical research value. In order to explore the effect of combined application of rituximab and plasma exchange, 70 TTP patients were selected in this study, and the results are reported as follows.

2. Materials and methods

2.1. General information

70 patients with thrombotic thrombocytopenic purpura that were treated in our hospital from January 2022 to January 2023 were selected for this study. They were divided into a control group and an observation group according to the treatment methods received, with 35 cases in each group. The oldest patient in the observation group was 73 years old, and the youngest was 12 years old, with an average of 35.4 ± 2.2 years old. Among them, there were 20 males and 15 females. The oldest patient in the control group was 72 years old, and the youngest was 11 years old, with an of 35.5 ± 2.5 years old. Among them, there were 19 males, and 16 females. There was no significant difference in general information of the two groups of patients ($P > 0.05$).

2.2. Methods

Patients in the control group underwent plasma exchange treatment, involving the use of a blood cell separator to replace fresh frozen plasma once daily, with a volume of 2-4L per session. Throughout the plasma exchange procedure, electrocardiogram (ECG) monitoring was conducted, along with observation of pulse, blood pressure, and other indicators. Following the exchange, monitoring of serum lactate dehydrogenase, serum free hemoglobin, and platelet count was performed. Plasma exchange was stopped when the platelet count exceeds 50 billion/L and serum lactate dehydrogenase, creatinine, and serum bilirubin showed a progressive decline.

Patients in the observation group received rituximab in addition to plasma exchange. Rituximab was injected intravenously at a dose of 375 mg/m^2, 4 times a week along with gastric mucosal protective agents, hepatoprotective anticonvulsant drugs, and antibiotics. Intravenous and enteral nutritional supplement were also given to patients.

2.3. Observation indicators

Therapeutic evaluation included the following categories: “very effective,” signifying complete disappearance of TTP symptoms and normalization of indicators; “effective,” indicating relief of TTP symptoms and substantial improvement in indicators; and “not effective,” denoting the absence of noticeable improvement in TTP symptoms and related indicators. Adverse reactions in patients were observed, which includes fatigue, headache, nausea, and the incidence rate was calculated.

2.4. Statistical methods

SPSS 20.0 process the data of both group. A *t*-test was performed to compare the data of both groups, and the measurement data was represented by mean ± standard deviation, with $P < 0.05$ indicating statistical significance.

3. Results

3.1. Comparing the therapeutic effects of the two groups of patients

The rate of effectiveness of the observation group and the control group was 97.14% and 82.86%. A better

therapeutic effect was observed in the observation group ($P < 0.05$), as shown in **Table 1**.

Table 1. The therapeutic effect of two groups of patients (*n* [%])

Group	Number of cases	Very effective	Effective	Not effective	Total rate of effectiveness
Observation group	35	20	14	1	34 (97.14)
Control group	35	15	14	6	29 (82.86)
x^2					3.9683
P-value					0.046

3.2. Comparison of the incidence of adverse reactions

The incidence of adverse reactions in the observation group and the control group was 5.71% and 22.86%, respectively. The incidence of adverse reactions in the observation group was lower than the control group ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of the incidence of adverse reactions [n (%)]

Group	Number of cases (*n*)	Fatigue	Headache	Nausea	Rate of incidence
Observation group	35	1	0	1	2 (5.71)
Control group	35	3	2	3	8 (22.86)
x^2					4.2000
P-value					0.040

4. Discussion

TTP is a severe thrombotic microvascular disorder with widespread characteristics. The condition primarily presents as microangiopathic hemolytic anemia, neurological abnormalities, and a decrease in platelet aggregation. Many patients will also have microthrombosis, which will lead to organ damage [3-5]. As of now, the pathogenic factors of TTP are yet to be clarified. However, after extensive medical studies, it was found that the disease may be related to factors such as infection, vascular disease, and drug allergy [6-8]. Patients with thrombocytopenia and microangiopathic hemolysis should undergo plasma exchange, and the activity of von Willebrand factor cleavage protease and inhibitors should be detected.

The traditional approach for treating TTP involves the administration of glucocorticoids alongside plasma exchange. Upon completion of the plasma exchange, analysis of the plasma often shows effective removal of the implicated coagulation factor, while supplementation of von Willebrand factor cleavage protease aids in patient recovery. Regarding rituximab, it falls under the category of a CD20 monoclonal chimeric antibody, and it directly targets and eliminates pertinent pathogenic factors, yielding notable effects in treatment [9]. Some studies have shown [10,11] that if the patient's disease is in the early stage, rituximab can be used to restore the platelet to normal level as soon as possible, reduce the number of plasma exchange, and promote the recovery of the disease.

In this study, the rate of effectiveness of the treatment received in the observation group and the control group was 97.14% and 82.86%, respectively, which meant that the therapeutic effect of the observation group was better ($P < 0.05$). The incidence of adverse reactions in the observation group and the control group was 5.71% and 22.86%, respectively, which indicated that and the incidence of adverse reactions in the observation group was lower ($P < 0.05$).

5. Conclusion

In conclusion, the combined use of rituximab alongside pure plasma exchange treatment demonstrates enhanced therapeutic efficacy and a lowered occurrence of adverse reactions. This approach is notably safe and holds considerable practical significance

Disclosure statement

The authors declare no conflict of interest.

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