Journal of Clinical and Nursing Research

Research Article

BIO-BYWORD SCIENTIFIC PUBLISHING PTY LTD

Effects of Intravenous Thrombolytic Therapy with Alteplase on Neurological Function, Coagulation Function and Serum Inflammatory Factors in Patients with Acute Cerebral Infarction

Xianfang Yue[1], Hua Zhou[2]

[1]University of Science and Technology Beijing, Haidian District, Beijing 100083, China

[2]Peking University Third Hospital, Haidian District, Beijing 100191, China

Abstract: ***Objective:*** To investigate the effects of intravenous thrombolysis therapy with alteplase on neurological function, coagulation function and serum inflammatory factors in patients with acute cerebral infarction. ***Methods:*** A total of 96 patients with acute cerebral infarction admitted to our hospital from September 2017 to October 2019 were randomly divided into two groups, with 48 patients in each group. The control group (n=48) received routine treatment, and the observation group received intravenous thrombolysis therapy with alteplase on the basis of routine treatment. The neurological deficit score, prothrombin time(PT), activated partial thromboplastin time (APTT), tumor necrosis factor-a level (TNF-α), and high-sensitivity C-reactive protein (hs-CRP) were compared between the two groups after 15 days of treatment. ***Results:*** After treatment, NIHSS scores in both groups were lower than those before treatment; PT levels were increased, while APTT, TNF-α and hs-CRP levels were all decreased in both groups, and the changes in the observation group were greater than those in the control group, with statistically significant difference (P<0.05). ***Conclusions:*** Intravenous thrombolysis therapy with alteplase can improve the neurological function, coagulation function and serum levels of inflammatory factors in patients with acute cerebral infarction, which is worthy of clinical application.

Keywords: Acute cerebral infarction; Alteplase; Intravenous thrombolysis; Neurological function; Coagulation function; Serum levels of inflammatory factors

Publication date: May, 2020

Publication online: 31 March, 2020

***Corresponding author:** Xianfang Yue, yuexf@me.ustb.edu.cn

Acute cerebral infarction refers to the necrosis of brain tissue caused by the sudden interruption of cerebral blood supply in patients. Generally, the disease is mainly caused by the insufficiency of focal acute cerebral blood supply, which is caused by lumen stenosis or even occlusion, while lumen stenosis or occlusion is due to atherosclerosis and thrombosis of the arteries supplying blood to the brain. Clinical thrombolytic therapy is a commonly used method to dissolve blood clots so that brain tissues (areas blocked by blood perfusion) can regain blood oxygen supply and blood vessels can recanalize. Based on this, this study analyzed the effects of intravenous thrombolysis therapy with alteplase on neurological function, coagulation function and serum inflammatory factors in patients with acute cerebral infarction.

1 Materials and Methods

1.1 General data

This study was approved by the medical ethics committee of our hospital. A total of 96 patients with acute cerebral infarction admitted to our hospital from September 2017 to October 2019 were selected and randomly divided into two groups, with 48 patients in

each group. In the control group, there were 30 males and 18 females, aged 48-79 years, with the average age of (64.37±8.52) years; the course of disease was 1-3h, with the average time of (1.45±0.22) h. In the observation group, there were 31 males and 17 females, aged 48-80 years, with the average age of (64.41±8.49) years; the course of disease was 1-3h, with the average time of (1.41±0.27) h. There was no significant difference in general data between the two groups, which are comparable (P>0.05).

1.2 Inclusion and exclusion criteria

Inclusion criteria: (1) patients who were in accordance with the diagnostic standard of the China Guideline for the Diagnosis and Treatment of Acute Ischemic Stroke[1]; (2) patients with no allergic history of the drug in this study were included. Patients and their families signed the informed consent.

Exclusion criteria: (1) patients with the onset time of > 3h; (2) patients with obvious tendency of intracranial hemorrhage; (3) patients with previous history of aneurysm; (4) patients with a history of intracranial surgery within one month prior to the study; (5) patients with mental diseases were excluded.

1.3 Methods

Control group: the control group received routine treatments, including: adjusting blood pressure according to the patient's condition; keeping the patient breathing smoothly; preventing respiratory and urinary tract infections; giving mannitol (Furen Pharmaceutical Group Co., Ltd., Approval No.H32020532, Specification: 100ml: 20 g) to the patient to reduce intracranial pressure and cerebral edema by intravenous drip within 30-60 minutes with a concentration of 15%-25%; performing early passive movement of the affected limb to avoid pressure and the formation of bedsores; giving nasal feeding, intravenous high nutrition, etc. according to the specific conditions of the patient.

Observation group: Intravenous thrombolysis therapy was added on the basis of routine treatment in the control group. Altiplase (Boehringer Ingelheim Pharma GmbH & Co. KG, S20160054, specification: 20mg/dose) 0.9 mg/kg was injected intravenously at 10% of the total dose of body weight, and the remaining dose was followed by continuous intravenous drip for 60 min, once daily. Both groups were treated for 15d.

1.4 Evaluation index

(1) Before and 15 days after treatment, the neurological deficits of the two groups were compared and evaluated using the National Institutes of Health Stroke Scale (NIHSS) scores from the aspects of patient consciousness level, facial paralysis, visual field, gaze, upper and lower limb movement, language, *etc*. The total score was 45 points. Higher scores indicate more severe neurological deficit. (2) Before and 15 days after treatment, the coagulation function of the two groups was compared. 5 mL of fasting venous blood was taken from the patients. ACL-200 coagulation instrument and the original supporting reagent produced by Beckman Coulter Inc. (Brea, USA) were used to determine PT and APTT. (3) Before and 15 days after treatment, 5 mL of fasting venous blood was collected from the patient, and the serum levels of TNF-α and hs-CRP were measured by ELISA.

1.5 Statistical analysis

SPSS20.0 statistical software was used for data statistical analysis. The measurement data are expressed as mean ± standard deviation (mean ± SD). T test was used for comparison between groups in the case of normal distribution. Non-parametric test was used for non-normal distribution. $P < 0.05$ is considered as statistically significant difference.

2 Results

2.1 NIHSS score

After treatment, NIHSS scores of the two groups were reduced, and the score of the observation group was lower as compared with the control group, indicating statistically significant difference ($P < 0.05$, Table 1).

Table 1. Comparison of NIHSS score between the two groups (mean ± SD, points)

Groups	Before treatment	After treatment	*t*	*P*
Control group (n=48)	18.94±3.52	12.61±3.25	9.154	0.000
Observation group (n=48)	18.85±3.63	7.34±2.49	18.116	0.000
t	0.123	8.918		
P	0.902	0.000		

2.2 Coagulation function

After treatment, PT was increased and APTT was decreased in both groups. Compared with the control group, the observation group had greater change range, showing statistically significant difference (P<0.05, Table 2).

Table 2. Comparison of coagulation function between the two groups (mean ± SD, cm/s)

Groups	PT				APTT			
	Before treatment	After treatment	*t*	*P*	Before treatment	After treatment	*t*	*P*
Control group (n=48)	6.32±1.24	9.58±1.67	10.859	0.000	43.26±5.83	38.37±5.14	4.359	0.000
Observation group (n=48)	6.29±1.31	14.45±1.83	25.120	0.000	43.22±5.85	31.39±4.38	11.215	0.000
t	0.115	13.619			0.034	7.161		
P	0.909	0.000			0.973	0.000		

2.3 Inflammatory factor

After treatment, TNF-α and hs-CRP were decreased in both groups, which were lower in the observation group as compared with those in the control group, suggesting statistically significant difference (P < 0.05, Table 3).

Table 3. Comparison of inflammatory factor levels between the two groups (mean ± SD)

Groups	TNF-a(ng/L)				hs-CRP(mg/L)			
	Before treatment	After treatment	*t*	*P*	Before treatment	After treatment	*t*	*P*
Control group (n=48)	27.18±2.61	20.57±2.42	12.867	0.000	17.35±3.64	12.38±2.62	7.678	0.000
Observation group (n=48)	27.21±2.56	12.76±1.51	33.684	0.000	17.31±3.71	6.56±1.13	19.204	0.000
t	0.057	18.969			0.053	14.132		
P	0.955	0.000			0.958	0.000		

3 Discussion

The pathogenesis of acute cerebral infarction is extremely complex, and its etiology may be the stenosis and blockage of cerebral arteries caused by abnormal blood vessels, blood, and hemodynamics. The onset of the disease is sudden and often occurs in rest or sleep, peaking in a few hours or 1-2 days.

The results of this study showed that after treatment, NIHSS score in both groups was lower than before treatment, PT was increased, and APTT, TNF-, and hs-CRP were all decreased, and the change ranges of the observation group were greater than those of the control group, indicating that intravenous thrombolysis therapy with alteplase could improve the neurological function, coagulation function and serum inflammatory factor levels in patients with acute cerebral infarction. After filtering through the glomerulus, mannitol plays a role of osmotic diuretic, which increases the osmotic pressure of the plasma, increases the water in the blood vessels and enters the tissue, reduces the cerebrospinal fluid volume and the pressure of the intracranial, intraocular, and cerebrospinal fluid, thus achieving the purpose of blood volume increase, tissue edema reduction, promotion of the secretion of prostaglandin I2, renal vascular dilation, and renal blood flow increase. Alteplase is a kind of glycoprotein, which is a recombinant human tissue type plasminogen activator. Alteplase should be administered within the shortest time after onset of the symptoms. It cannot be mixed with other drugs. The prepared solution can be further diluted with 0.9% sterile saline, but cannot be further diluted with sterile water for injection or glucose, which can be used only by doctors with appropriate training and experience in thrombolytic treatment, and equipment should be used for monitoring[2]. When

the patient is given the drug intravenously, it can be quickly cleared from the blood circulation. The liver is the main metabolic pathway, and the half-life is 4-5min (relative to the plasma α). The plasma alteplase content is less than 10%, and after the initial value of 20mim, the β half-life was about 40 min[3, 4]. Once alteplase is activated after binding to fibrin, it can degrade fibrin, dissolve blood clots, and directly activate plasminogen and convert it into plasmin, showing a relatively inactive state in the circulatory system[5].

In conclusion, intravenous thrombolysis therapy with alteplase can improve the neurological function, coagulation function and serum levels of inflammatory factors in patients with acute cerebral infarction, which is worthy of clinical application.

References

[1] Neurology Branch of Chinese Medical Association. China Guideline for the Diagnosis and Treatment of Acute Ischemic Stroke 2014[J]. Chinese Journal of Neurology 2015; 48(4): 246-257.

[2] Pan XF, Qin L, Han Y, et al. The analysis of the risk factor for early neurologic deterioration in using Alteplase Thrombolysis to treat acute cerebral infarction[J]. Stroke and Nervous Diseases 2019, 26(2): 140-142.

[3] Liu XD, Zhang LJ, Yang L, et al. Effects of Xueshuantong combined with alteplase on neurological function in patients with acute cerebral infarction and its mechanism[J]. Chinese Journal of Hospital Pharmacy, 2019, 39 (5): 493-496.

[4] Gao YF. Effect analysis of hyperbaric oxygen combined with alteplase intravenous thrombolysis in the treatment of acute cerebral infarction [J]. Chinese Remedies & Clinics, 2019, 19(23): 4148-4150.

[5] Liu W, Chen GF, Liang YX, et al. White matter hyperintensities and prognosis of patients with acute cerebral infarction treated by intravenous thrombolysis with alteplase: an analysis of influencing factors [J]. Chinese Journal of Cerebrovascular Diseases 2019; 16(10): 508-513.