INFLUENCE OF THE TYPE AND NUMBER OF COMPLICATIONS ON PLATELET FUNCTION IN ACUTE CEREBRAL INFARCTION PATIENTS

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ABSTRACT

Objective*: To investigate the influence of the type and number of complications on platelet function in patients with acute cerebral infarction (ACI).*

Methods*: The baseline clinical data of 386 ACI patients admitted to our hospital from January 2017 to December 2019 were analyzed retrospectively. All patients were grouped according to the type and number of complications, included 67 cases without complications, 70 cases with diabetes, 139 cases with hyperlipidemia, 168 cases with hypertension, and 42 cases with two or more complications. The level of maximum aggregation rate (MAR) before and after treatment was detected, and the influence of MAR level on the National Institutes of Health Stroke Scale (NIHSS) score and modified Rankin Scale (mRS) score was analyzed.*

Results*: Before treatment, the MAR levels in the multi-complication group, diabetes group, hy-perlipidemia group, hypertension group and non-complication group showed a trend of decreasing in turn (P<0.05). 2d, 7d and 4w after treatment, the MAR levels in these groups at were significantly lower than before treatment (P<0.05). After 12 weeks of treatment, the MAR levels in the multi-complication group, diabetes group and hyperlipidemia group were significantly higher than those in the non-complication group and hypertension group (P<0.05). After 12 weeks of treatment, the MAR levels in the multi-complication group, diabetes group and hyperlipidemia group showed a trend of decreasing in turn (P<0.05). The NIHSS score and mRS score decreased with the decrease of MAR level in the non-complication group, diabetes group, hyperlipidemia group and hypertension group (P<0.05). The NIHSS score and mRS score decreased with the decrease of MAR level in the multi-complication group (P<0.05). 7d after treatment, the decrease of MAR level in the multi-complication group was higher than that of NIHSS score and mRS score (P<0.05).*

Conclusion*: Higher platelet aggregation ability is observed in ACI patients, and the detection of MAR level can be used to evaluate the severity of the disease and the efficacy of antiplatelet drugs.*

Keywords: *acute cerebral infarction, platelet function, maximum aggregation rate, NIHSS score; mRS score.*

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Introduction

Recent studies have shown that platelet function detection can be used as an important basis for diagnosing acute cerebral infarction (ACI), and also guide the efficacy evaluation and dose adjustment of oral antiplatelet drugs, so as to guarantee the prevention and treatment effect on thrombotic diseases and mini-mize the risk of adverse reaction[1,2].

Some scholars have documented that ACI patients have a high platelet aggregation rate, while the relapsed population tends to have an even higher platelet aggregation rate[3]. Other reports hold that the platelet aggregation rate of ACI patients with di-abetes is significantly higher than those with diabetes alone and people who are healthy in physical examination[4]. However, it remains unclear whether the same changes in platelet function exist in patients with other types of complica-tions.

In this paper, the baseline clinical data of 386 ACI patients admitted to our hospital from January 2017 to December 2019 were analyzed retrospectively. All patients were grouped according to the type and number of complications, and their platelet function was detected, in order to explore the influence of the type and number of complications on platelet function in ACI patients. Below, the process will be reported.

Data and methods

General data

The baseline clinical data of 386 ACI patients admitted to our hospital from January 2017 to December 2019 were analyzed retrospectively. All patients were grouped according to the type and number of complications, included 67 cases without complications, 70 cases with diabetes, 139 cases with hyper-lipidemia, 168 cases with hypertension, and 42 cases with two or more compli-cations. Inclusion criteria: meeting the diagnostic criteria of ACI (5); being ad-mitted within 48 hours after onset; not receiving regular antiplatelet therapy in the last 12 weeks; complete clinical data; Exclusion criteria: the ACI was induced by cardiogenic embolism or other rea-sons; undergoing acute myocardial in-farction, peripheral vascular occlusive disease or major surgery in the last 6 months; acute and chronic infection; malignant tumor; connective tissue dis-ease; hemolytic anemia; thyroid dys-function; renal insufficiency and de-compensation; cardiopulmonary dys-function; complicated with other nerv-ous system diseases; mental diseases. Diabetes and hypertension were diag-nosed by the WHO diagnostic criteria (1999). The diagnostic criteria of hyper-lipidemia were that the level of LDL-C was greater than or equal to 3.4 mmol/L[(5)]. The study design complied with the Declaration of Helsinki, and the patients and their families signed informed con-sent.

Methods

The selected patients who met thrombolysis indications were adminis-tered rt-PA thrombolysis, edaravone 30mg, IV drip, qd; butylphthalide 100ml, IV drip, qd; apirin 100mg, per os, qd; copidogrel 75mg, per os, qd; aorvastatin calcium 20mg, per os, qd. The platelet function was detected by Siemens IN-NOVANCE ® PFA-200 System. 0.5 ml citrate was added to resist coagulation. At first, the baseline platelet count was rec-orded twice, then aggregation inducers AA and ADP were added successively and the number of platelets was counted continuously. When the count reached the minimum, the detection stopped. The maximum aggregation rate (MAR) = (the mean of baseline platelet counts -minimum platelet count)/the mean of baseline platelet counts×100%. The de-gree of neurological impairment was measured by NIHSS, and the prognosis was evaluated by the modified Rankin Scale (mRS) (6).

Statistical method

SPSS20.0 software was selected to processed the data. The measurement data conforming to normal distribution were compared by an independent sample t-test and expressed by (±s). The trend analysis was done with a χ^2 test. $P<0.05$ represented statistically significant.

Results

Comparison of MAR Levels in Different Groups Before and After Treatment

Before treatment, the MAR levels in the multi-complication group, diabetes group, hyperlipidemia group, hyperten-sion group and non-complication group showed a trend of decreasing in turn ($P<0.05$). 2d, 7d and 4w after treatment, the MAR levels in these groups at were significantly lower than before treatment ($P<0.05$). After 12 weeks of treatment, the MAR levels in the multi-complication group, diabetes group and hyperlipidemia group were significantly higher than those in the non-complication group and hy-pertension group ($P<0.05$). After 12 weeks of treatment, the MAR levels in the multi-complication group, diabetes group and hyperlipidemia group showed a trend of decreasing in turn ($P<0.05$); See Table 1.

Influence of MAR Level on NIHSS score and mRS score in the non-complication group/single complication groups

The NIHSS score and mRS score decreased with the decrease of MAR level in the non-complication group, diabetes group, hyperlipidemia group and hyper-tension group ($P<0.05$); See Table 1.

Influence of MAR level on NIHSS score and mRS score in the multi-complication group

The NIHSS score and mRS score decreased with the decrease of MAR level in the multi-complication group ($P<0.05$). 7d after treatment, the

decrease of MAR level in the multi-complication group was higher than that of NIHSS score and mRS score (P<0.05); See Table 1.

Indicator	Before Treatment	2d After Treatment	7d After Treatment	4w After Treatment	12w After Treatment
Non-complication group					
MAR (%)	38.46±5.64	36.02±6.40	33.05±5.30	30.20±5.83	27.45±5.47
NIHSS score	9.81±1.42	8.25±1.34	7.56±1.44	6.20±1.21	6.47±1.35
mRS score	3.52±0.60	3.27±0.75	2.84±0.21	2.47±0.69	1.48±0.70
Diabetes group					
MAR (%)	41.90±5.35	39.94±6.37	35.46±5.64	33.51±5.77	31.80±5.33
NIHSS score	9.68±1.85	9.08±1.41	8.13±1.65	7.15±1.39	6.81±1.25
mRS score	3.62±0.52	3.30±0.54	3.07±0.61	2.59±0.46	2.25±0.30
Hyperlipidemia group					
MAR (%)	40.68±5.03	37.98±6.14	33.33±5.69	31.43±5.75	28.55±4.42
NIHSS score	9.87±1.13	8.76±1.25	8.40±0.92	7.40±1.39	7.33±1.29
mRS score	3.11±0.85	3.26±0.77	2.75±0.67	2.37±0.54	2.19±0.42
Hypertension group					
MAR (%)	39.57±5.40	37.64±5.43	34.65±5.17	29.23±5.30	24.58±4.46
NIHSS score	9.61±1.52	9.54±1.70	8.26±1.37	7.19±1.26	5.39±1.63
mRS score	3.62±0.75	3.47±0.61	3.11±0.65	2.77±0.45	2.50±0.35
Multi-complication group					
MAR (%)	43.83±6.71	41.90±5.87	37.03±5.88	32.48±5.68	28.67±5.04
NIHSS score	9.89±1.42	9.12±1.68	9.81±1.37	8.90±1.12	7.40±1.35
mRS score	3.68±0.57	3.52±0.70	3.43±0.59	2.65±0.55	2.43±0.53

Table 1: Influence of MAR Level on NIHSS score and mRS score.

Discussion

At present, ACI has become one of the major deadly and disabling diseases in the world. Currently, it is believed that thrombogenesis secondary to abnormal aggregation of platelet plays a key role in the occurrence and development of this disease[7]. To keep platelet function within the normal range actively and ef-fectively is of vital significance for the prevention and treatment of thrombotic disease. Based on the above evidence, antiplatelet drugs have become funda-mental drugs for the clinical treatment and secondary prevention of ACI, and showed good superiority in postponing the progression and recurrence of the disease[8]. In clinical practice, however, there are still some ACI patients who re-lapse into cerebrovascular occlusion after receiving regular antiplatelet therapy, in-dicating high reactivity of platelets[9].

Foreign scholars have revealed that the detection of platelet functions can dynamically reflect the therapeutic effect of antiplatelet drugs and guide clinicians to adjust the dose of drugs[10]. Relevant reports have also confirmed that inade-quate detection of platelet function leads to an increase of 30%~40% in the recur-rence risk of thrombotic disease[11,12]. To evaluate the resistance to antiplatelet drugs in a timely and accurate manner by monitoring the platelet aggregation rate, so as to guide individualized treatment has drawn increasing attention from the medical community.

Previous studies have shown that in the acute phase, abnormal platelet acti-vation was seen in ACI patients[13,14], and as induced by arachidonic acid and adenosine diphosphate , their MAR levels increased accordingly. While in the re-covery phase, the MAR level fell signif-icantly. On the other hand, the platelet aggregation rate in ACI patients during relapse was often higher than during the initial attack. According to another report, a marked decline in platelet aggregation rate was seen in ACI patients with un-derlying diseases, such as diabetes, hy-pertension and hyperlipidemia[15-17].

This report, however, adopted phototurbi-dometry to measure platelet aggregation rate, which had complex operation, high price and little application in actual clin-ical work, and the samples included in this study were also insufficient.

In view of the above problems, our study calcu-lated the MAR level through automatic detection of platelet function, and demonstrated good reproducibility and accuracy. According to the results of our study, before treatment, the MAR levels in the multi-complication group, diabetes group, hyperlipidemia group, hyperten-sion group and non-complication group showed a trend of decreasing in turn (P<0.05). 2d, 7d and 4w after treatment, the MAR levels in these groups at were significantly lower than before treatment (P<0.05). After 12 weeks of treatment, the MAR levels in the multi-complication group, diabetes group and hyperlipidemia group were significantly higher than those in the non-complication group and hy-pertension group (P<0.05). After 12 weeks of treatment, the MAR levels in the multi-complication group, diabetes group and hyperlipidemia group showed a trend of decreasing in turn (P<0.05); The NIHSS score and mRS score decreased with the decrease of MAR level in the non-complication group, diabetes group, hyperlipidemia group and hypertension group (P<0.05). The NIHSS score and mRS score decreased with the decrease of MAR level in the multi-complication group (P<0.05). 7d after treatment, the decrease of MAR level in the mul-ti-complication group was higher than that of NIHSS score and mRS score (P<0.05), indicating that there were significant dif-ferences in platelet aggregation rate among ACI patients with different

types and numbers of complications, and their clinical prognosis also had something to do with platelet aggregation rate.

To sum up, higher platelet aggrega-tion ability is observed in ACI patients, and the detection of MAR level can be used to evaluate the severity of the dis-ease and the efficacy of antiplatelet drugs.

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