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Changes of Platelet Parameters before and after Surgery in Patients with Subarachnoid Hemorrhage

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Abstract

Objective To analyze the clinical application value of platelet parameter changes before and after surgery in patients with subarachnoid hemorrhage in our hospital, and to provide basis for clinical condition observation. Methods A total of 354 patients with subarachnoid hemorrhage who were hospitalized in our hospital from January 2017 to July 2021 were selected, and compared with 217 healthy individuals during the same period. The 4 parameters in platelet venous blood before and after surgery were analyzed: platelet count (Plt), mean platelet volume (MPV), platelet volume (PCT), and platelet distribution density (PDW). Results Before operation: Platelet count (PLT) decreased compared with the normal control group ($p<0.01$), MPV and PDW were increased compared with the normal control group ($p<0.01$); PLT increased after operation ($p<0.01$), but higher than that of the normal control group. Conclusions Early surgical treatment of aneurysmal subarachnoid hemorrhage can seal the ruptured blood vessel, reduce the exposure of endothelial cells, inhibit platelet activation, and reduce the formation of microthrombi.

Keywords

Subarachnoid Hemorrhage; Surgery; Platelets.

1. Introduction

Subarachnoid hemorrhage (SAH) is an acute cerebrovascular disease. Blood flows into the subarachnoid space after the rupture of blood vessels on the surface or bottom of the brain tissue caused by various factors, of which about 85% of the subarachnoid space. Subarachnoid hemorrhage (SAH) is an acute cerebrovascular disease (aSAH) [1]. aSAH has the characteristics of high fatality rate, high disability rate and poor prognosis, and 10% of them die suddenly due to intracranial hypertension. With the continuous development of medical technology, the prognosis of aSAH patients has been improved to a certain extent, but the mortality rate is still as high as 40%-50% [2], and the survivors are left with varying degrees of dysfunction. Delayed cerebral ischemia (DCI) after aSAH is one of the main causes of high mortality and poor neurological prognosis in patients with aSAH [3]. Therefore, early identification and intervention of DCI is of great significance to improve the prognosis and survival rate of aSAH patients. At present, the mechanism of DCI is believed to be one of the important mechanisms besides cerebral vasospasm [4]. After aneurysm blood vessels rupture and hemorrhage caused by various factors, the subendothelial tissue is exposed, and the glycoprotein GPIb/IX on the platelet membrane adheres to the damaged vascular endothelial cells through von Willebrand factor (VWF), P-selectin, etc. Platelet activation, releasing active substances such as thromboxane A2 and serotonin, aggravating platelet aggregation and forming platelet thrombus; Platelet activation, releasing active substances such as thromboxane A2 and serotonin, aggravating platelet aggregation and forming platelet thrombus; On the other hand, after the blood vessel is damaged, the coagulation system is activated, and blood coagulation occurs rapidly locally, converting fibrinogen into insoluble fibrin, thereby forming a thrombus; On the other hand, after the blood vessel is damaged, the coagulation system is activated, and

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blood coagulation occurs rapidly locally, converting fibrinogen into insoluble fibrin, thereby forming a thrombus; Thrombin can combine with platelet surface receptors to promote platelet aggregation, and platelets can provide negatively charged phospholipids for Promote the activation of the coagulation system, and the interaction between the two is involved in the formation of thrombus [5]. However, timely surgery after aSAH can repair the ruptured blood vessels in time, reduce the exposure of endothelial cells, and whether it can reduce the activation of local platelets and the formation of microthrombi has not been reported so far. Therefore, we retrospectively analyzed 354 patients with subarachnoid hemorrhage who were hospitalized in our hospital from January 2017 to July 2021. The changes of 4 parameters of platelets before and after surgery were compared with those of the normal control group, which was used for clinical condition observation and treatment. Therefore, we retrospectively analyzed 354 patients with subarachnoid hemorrhage who were hospitalized in our hospital from January 2017 to July 2021. The changes of 4 parameters of platelets before and after surgery were compared with those of the normal control group, which was used for clinical condition observation and treatment guidance.

2. Data and Methods

2.1. General Information

A total of 354 patients with subarachnoid hemorrhage who were hospitalized in our hospital from January 2017 to July 2021, aged 5 to 84 years [average (59.07±9.21)] years old, including 220 females and 134 males, had aneurysm 56 cases of clipping, 275 cases of embolization, 17 cases of lesion resection, and the other 6 cases, all signed informed consent by themselves or their families.

Inclusion criteria: ① All met the diagnostic criteria of "China Guidelines for the Diagnosis and Treatment of Subarachnoid Hemorrhage 2015" formulated by the Cerebrovascular Disease Group of the Neurology Branch of the Chinese Medical Association [6]; ② The diagnosis of subarachnoid hemorrhage was confirmed by head CT or lumbar puncture, underwent head CT angiography to confirm the diagnosis of intracranial aneurysm; ③ initial onset; ④ no drug, surgery and other treatment before admission; ⑤ complete clinical data; ⑥ all patients and their families signed informed consent. Exclusion criteria: ① patients with SAH caused by other reasons; ② patients with severe heart, liver, kidney and other organ dysfunction; ③ patients with blood system and autoimmune diseases; ④ patients with brain tumors or malignant tumors of other organs; ⑤ pregnancy and breast-feeding women; ⑥ Those with incomplete clinical data. A total of 217 healthy subjects during the same period were selected as the control group, and there was no statistical difference in age and gender between the two groups. This study was approved by the hospital ethics committee.

2.2. Methods

Instruments and reagents SYSMEX i-1000 blood cell analyzer instrument and instrument supporting reagents； SYSMEX blood cell quality control material as the quality control material.

Test method the venous blood of the patients before and after the operation and the normal control group was collected in the EDTA-K3 vacuum blood collection tube on an empty stomach in the morning. Immediately after blood collection, invert and mix. The platelet count (Plt), mean platelet volume (MPV), platelet volume (PCT), and platelet distribution density (PDW) of EDTA-K3 anticoagulant were detected and recorded in strict accordance with the instrument's operating procedures.

Statistical methods the data are expressed as $x\pm s$, the statistics are analyzed by variance analysis, and the comparison between groups is by Dunnett-t test, $P<0.05$ has statistical difference.

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3. Results

1. General situation 354 patients with subarachnoid hemorrhage surgery, 354 cases were included in the statistics, 217 cases in the control group, 217 cases were included in the statistics, no leakage.

2. Before surgery(BS): Platelet count (PLT) decreased compared with the normal control group(NC) ($p<0.01$), MPV and PDW were increased compared with the normal control group ($p<0.01$); PLT increased after surgery(AS) ($p<0.01$), but higher than normal control group had less ($p<0.01$); MPV and PDW after surgery were less than those before surgery ($p<0.01$), but increased compared with the normal control group ($p<0.01$); PCL before and after surgery had no significant change compared with the normal control group ($P>0.05$). See Table 1

Table 1. Comparison of the results of PLT, MPV, PCT, PDW in each group (x±s)

Group	n	PLT×109/L	PDW(fL)	MPV(fL)	PCT(%)
BS	354	217.23±61.42a	19.24±3.61a	10.25±1.67a	0.27±0.06d
AS	354	283.14±86.33bc	16.76±2.24bc	8.43±1.23bc	0.29±0.08d
NS	217	311.66±54.36	14.57±1.67	6.37±0.93	0.28±0.06

Note: before operation and normal control group, $aP<0.01$; before operation and after operation, $bP<0.01$; after operation and normal control group, $cP<0.01$; before and after operation and compared with normal control group, $dP>0.05$.

4. Discussion

Aneurysmal subarachnoid hemorrhage (aSAH) is a cerebral hemorrhagic disease with high morbidity, mortality and recurrence rate, and most surviving patients are accompanied by irreversible brain damage and disability, which seriously affects the patient's quality of life and brings heavy economic burden and mental pressure to patients and their families. Post-aSAH DCI is one of the main reasons for the high mortality and poor neurological prognosis of aSAH patients. Therefore, early identification and intervention of DCI is of great significance to improve the prognosis and survival rate of aSAH patients. At present, in addition to cerebral vasospasm, microthrombosis is an important cause of DCI, and the mechanism of microthrombosis is that after aneurysm rupture and hemorrhage caused by various factors, the subendothelial tissue is exposed, platelets and damaged vascular endothelial cells are exposed. At present, in addition to cerebral vasospasm, microthrombosis is an important cause of DCI, and the mechanism of microthrombosis is that after aneurysm rupture and hemorrhage caused by various factors, the subendothelial tissue is exposed, platelets and damaged vascular endothelial cells are exposed. Adhesion promotes platelet activation, and the blood coagulation system starts to form thrombus after blood vessel damage. Therefore, repairing the ruptured blood vessels in time and reducing the exposure of endothelial cells can reduce the activation of local platelets and reduce the formation of microthrombi? Therefore, we retrospectively analyzed 354 patients with subarachnoid hemorrhage who were hospitalized in our hospital from January 2017 to July 2021. The changes of 4 parameters of platelets before and after surgery were compared with those of the normal control group for clinical observation and treatment. Therefore, we retrospectively analyzed 354 patients with subarachnoid hemorrhage who were hospitalized in our hospital from January 2017 to July 2021. The changes of 4 parameters of platelets before and after surgery were compared with those of the normal control group, for clinical observation and treatment provide guidance.

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In our research it was found that before surgery(BS): Platelet count (PLT) decreased compared with the normal control group(NC) ($p<0.01$), MPV and PDW were increased compared with the normal control group ($p<0.01$); PLT increased after surgery(AS) ($p<0.01$), but higher than normal control group had less ($p<0.01$); MPV and PDW after surgery were less than those before surgery ($p<0.01$), but increased compared with the normal control group ($p<0.01$); PCL before and after surgery had no significant change compared with the normal control group ($P>0.05$).It shows that early surgical treatment of aneurysmal subarachnoid hemorrhage can seal the ruptured blood vessel, reduce the exposure of endothelial cells, inhibit platelet activation, and reduce the formation of microthrombi. However, it failed to return to normal levels after surgery, indicating that there are other possibilities to induce microthrombosis, and further antiplatelet therapy is required after surgery. Some people may think that antiplatelet therapy will aggravate bleeding. The author believes after appropriate surgical measures that bleeding is relatively small possibility, antiplatelet therapy is relatively safe, further literature will be described in the next article.

Among the 4 parameters of platelets, platelet count reflects the number of platelets in circulating blood, suggesting that their generation or aging platelet count is relatively rough and changes slowly, while MPV is an important biological indicator reflecting platelet function and activity. It plays an important role in the development of various cardiovascular and cerebrovascular diseases. MPV is an independent predictor for predicting the onset of hemorrhagic stroke patients, and its increased level is related to the severity of neurological deficit symptoms in patients [7].

Some studies have found that the MPV level in peripheral blood of patients with acute cerebral hemorrhage is significantly increased, and the MPV level is positively correlated with the severity of the patient's disease [8]. MPV reflects the proliferation, metabolism and platelet production of megakaryocytes in the bone marrow, and is closely related to the ultrastructure and functional status of platelets. An increase in MPV reflects an increase in platelet volume, which is an indirect sign of platelet activation, for every 1f L increase in MPV, the risk of stroke increases by 11% [9].

PDW reflects the degree of difference in platelet volume. When platelet destruction and consumption increase, platelet size is uneven and PDW increases. PDW reflects the degree of difference in platelet volume. When platelet destruction and consumption increase, platelet size is uneven and PDW increases. the volume and size of platelets are closely related to platelet enzymatic activity, ultrastructure and functional status.PCT is the specific volume of platelets, which reflects the proportion of platelet volume per unit volume of whole blood. PCT is related to the number and volume of platelets, and is used to supplement PLT [10]. Therefore, dynamic observation of the changes of the four parameters of platelets in cerebrovascular disease can easily predict the possible poor prognosis and take appropriate measures to intervene in the early stage.

All in all, early surgical treatment of aneurysmal subarachnoid hemorrhage can seal the ruptured blood vessel, reduce the exposure of endothelial cells, inhibit platelet activation, and reduce the formation of microthrombi.

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