

# **The role of monitoring platelet function perioperatively and platelet transfusion for operated spontaneous intracerebral hemorrhage patients with long-term oral antiplatelet therapy: a case report**

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## **Abstract**

Spontaneous intracerebral hemorrhage (SICH) with long-term oral antiplatelet therapy (LOAPT) is known as a dilemma in balancing the risk of postoperative rebleeding and ischemic events because of confused coagulation function. In this case, the authors reported a 42-year-old male SICH patient on LOAPT who received an emergency craniectomy. The thromboelastography suggested that the inhibition of platelet function was high preoperatively. After platelet transfusion during surgery and taking control of the clotting and platelet function postoperatively, the patient was stable without rebleeding and new ischemic events in perioperative period and recovered satisfactorily. The authors presented the importance of monitoring coagulation and platelet function perioperatively for SICH patients on LOAPT. Postoperatively, monitoring and taking control of clotting and platelet function would help in preventing rebleeding and ischemic events in SICH patients on LOAPT; moreover, platelet transfusion may quickly and safely reverse platelet dysfunction for emergency surgery.

**Key words:** Spontaneous intracerebral hemorrhage, Long-term oral antiplatelet therapy, Emergency surgery, Platelet function, Postoperative complication

## **Background**

As the population ages, the number of spontaneous intracerebral hemorrhage with long-term oral antiplatelet therapy patients continues to increase<sup>1</sup>. In such patients, many people miss the optimal timing of surgery due to the high risk of postoperative bleeding complication <sup>2</sup>, even though

emergency surgery is an effective way to reduce mortality<sup>3-6</sup>. On the other hand, some studies have shown that non-selective platelet transfusion not only couldn't improve outcome, but also increase ischemic events<sup>7-9</sup>. This is a medical dilemma for every neurosurgeon to treat such patient. In our case, we described a SICH patient on LOAPT performed an emergency surgery under monitoring the platelet function and shared our experience in treating such patients.

## 1. Case presentation

A 42-year-old male coma patient who suffered from SICH was transferred to our medical institution. The patient received long-term dual antiplatelet therapy (aspirin and clopidogrel) for recent cerebellar infarction before SICH. The Glasgow coma scale (GCS) was 8 and modified Rankin scale (mRS) was 5 at admission. An immediate computed tomography (CT) revealed a right frontotemporal hematoma with cerebral herniation. The preoperative laboratory examination demonstrated the routine blood tests and coagulation test as normal; However, the thromboelastography showed that platelet function was inhibited completely (citric acid kaolin (CK)-maximum amplitude (MA): 42mm; the inhibition rate of arachidonic acid (AA%): 78%; and, the inhibition rate of adenosine diphosphate (ADP%): 100%). Nine hours after SICH, an emergency craniectomy were performed to evacuate hematoma and decompress, with consent from the patients' family members and neurosurgeons. Ten hours after SICH, to improve the coagulation function, the platelet and plasma transfusion was performed during the surgery. On the third day after the surgery, the thromboelastography showed that the ADP% decreased by 40%, the AA% decreased by 24.8% and the CK-MA increased to 52mm; and, the routine CTs, which were performed postoperatively and on third and sixth day after surgery, didn't find the sign of rebleeding (**Fig.1**). Platelets count declined continuously after surgery and reached a minimum of  $51 \times 10^9/L$  on the fourth day after surgery but increased subsequently (**Fig.2.A**). Moreover, although APTT and PT was acceptable (**Fig.2.B**), the significantly decreased fibrinogen (**Fig.2.C**) were found on the fifth day after surgery. However, because the fibrinogen and platelet count recovered shortly afterwards and there was no sign of rebleeding or new ischemic stroke in CT (**Fig.1**), we didn't admit any special treatment. Notably, although the patient didn't restart antiplatelet therapy, there was no occurrence of special events later, and the patient was stable and recovered satisfactorily. Finally, the patient was discharged with GCS as 4T6 and mRS as 4. The patient was followed up routinely three months after SICH, and the result suggested that the patient detached from respirator and the GCS was 15. Six months after SICH, the condition of this patient was further improved and the mRS was 3.

## 2. Discussion

Rebleeding and ischemic events were two focus in managing SSICH patients on LOAPT<sup>10-12</sup>; how to balance the risk of these two events would help in improve patients' outcome<sup>13-18</sup>. However, rare studies have provided evidence for managing operated SICH patients on LOAPT, and whether platelet transfusion is recommended was controversial<sup>7-9,19-23</sup>. In this case, we presented our experience of managing these patients, that monitoring platelet function and platelet transfusion might help in perioperative management.

As described in previous similar studies, the high AA% or ADP% suggested an increased risk of

preoperative hematoma expansion and postoperative bleeding<sup>11,24,25</sup>. In this case, we also found that both of preoperative AA% and ADP% were quite high, which suggested that the patient was under a high risk of bleeding complication. After giving platelet transfusion, the AA% and ADP% were significantly safely declined on the third day after surgery without sign of rebleeding or ischemic events; and, by continually monitoring, although the platelet count was significantly decreased on the fourth day after surgery, the platelet function recovered to the normal, which might prevent from rebleeding. Based on these facts, our experience was that it's usually not clotting dysfunction in patients on LOAPT, and a neurosurgeon should pay more attention to platelet function rather than platelet count. Sometimes, the platelet count might be acceptable, but the inhibited proportion was high; thus, the useless platelet takes large part and the coagulation was still abnormal. Moreover, although there would be a massive consumption of platelet within 4 days after surgery, we thought that as long as the remaining platelet worked normally, which presented as CK-MA > 40mm and AA%/ADP% <60% in our experience, it could maintain the normal coagulation; however, if the platelet count was less than  $50 \times 10^9/L$ , we still recommended platelet transfusion to prevent rebleeding (our experience was presented as **Fig.3**).

Although there was still controversy about whether platelet transfusion should be considered for SICH patients on LOAPT<sup>7-9,19-23</sup>, some studies have shown that platelet transfusion can improve the platelet activity<sup>23,25</sup>. Physiologically, it usually takes at least seven days for platelet function to recover after stopping antiplatelet therapy<sup>26-28</sup>. However, several studies reported that platelet transfusion could improve the platelet function in a short period<sup>22,23,25</sup>. We found the similar fact, that both of AA% and ADP% decreased significantly within three days after platelet transfusion and recovered to a normal level at third day after surgery. Our case also supports the conclusion that platelet transfusion can improve platelet function. Therefore, we believe that if the patient had a platelet dysfunction caused by LOAPT, platelet transfusion should be considered intraoperatively or within 24 hours after surgery.

The safety of platelet transfusion was another concern in clinical work. The PATCH study and other similar studies demonstrated that platelet transfusion not only couldn't improve the outcome, but also caused a higher mortality and rate of ischemic events<sup>7-9</sup>. However, considering the coagulation was more critical for operated patients, we thought that the importance of platelet transfusion is to prevent postoperative rebleeding. In addition, for the patients with resistance of antiplatelet agent, non-selective platelet transfusion would increase the risk of thromboembolic events unnecessarily. Therefore, we recommended platelet transfusion for patients with significant platelet dysfunction. However, further studies were still needed to investigate the quickly and safely method to reverse the platelet function of patients on LOAPT for emergency surgery.

### **3. Conclusion**

Postoperatively, monitoring and taking control of clotting and platelet function would help in preventing rebleeding and ischemic events in SICH patients on LOAPT; moreover, platelet transfusion may quickly and safely reverse platelet dysfunction for emergency surgery.

### **List of abbreviations**

SICH	spontaneous intracerebral hemorrhage
LOAPT	long-term oral antiplatelet therapy
GCS	Glasgow coma scale
mRS	modified Rankin scale
CT	computed tomography
CK-MA	citric acid kaolin-maximum amplitude
AA%	the inhibition rate of arachidonic acid
ADP%	the inhibition rate of adenosine diphosphate
SSICH	severe spontaneous intracerebral hemorrhage

## **Declarations:**

### **Ethics approval and consent to participate**

The work was approved by the Institutional Review Board of Tiantan Hospital. Written informed consents will be obtained from their legally authorized representatives. Privacy of patient has been effectively protected.

### **Consent for publication**

Written informed consent for publication every authors.

### **Availability of data and material**

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

### **Competing interest**

All authors certify that we have no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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### **Authors' contributions**

Author contributions to the study and manuscript preparation include the following. Conception and design: all authors. Acquisition of data: K.W and M.L. Analysis and interpretation of data: K.W and Q.L. Drafting the article: K.W. Critically revising the article: all authors. Reviewing submitted version of manuscript: all authors. Approving the final version of the manuscript on behalf of all authors: J.W. Administrative/technical/material support: S.W and J.W. Study supervision: S.W and

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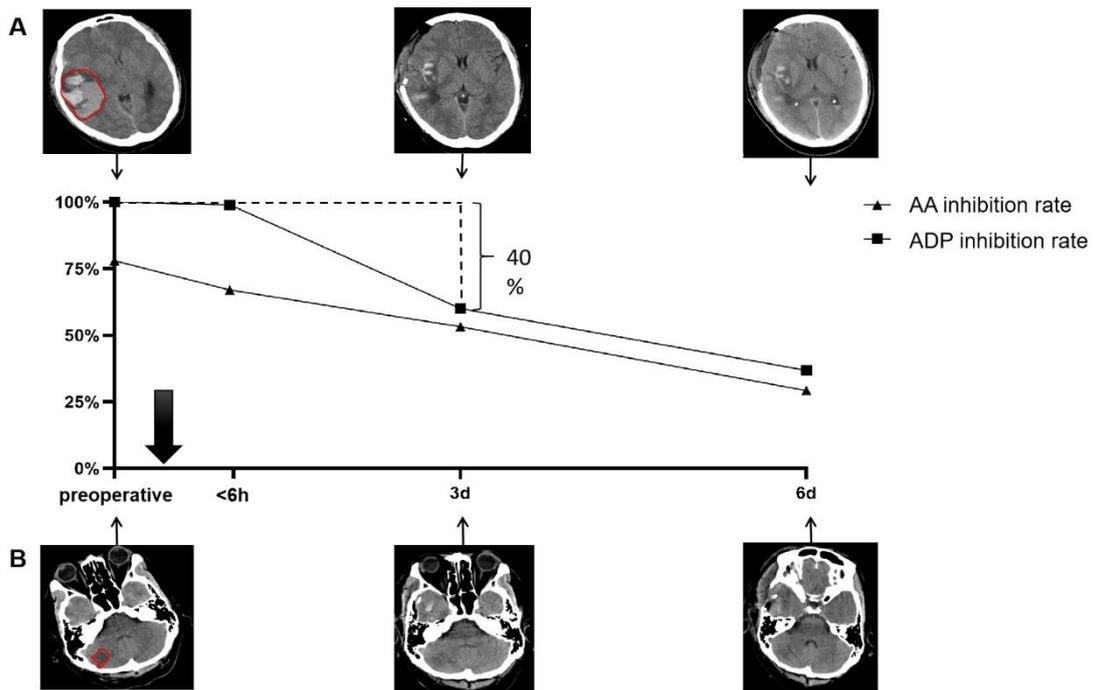


Fig.1 Thromboelastography was used to monitor platelet function perioperatively. The patients had a high inhibition rate preoperatively. After the platelet transfusion, the platelet function was significantly improved on the third day postoperatively. Postoperative CT follow-up showed no bleeding or ischemic complications. (A: intracerebral hemorrhage, B: cerebral infarction, the black arrows: operation and platelet transfusion)

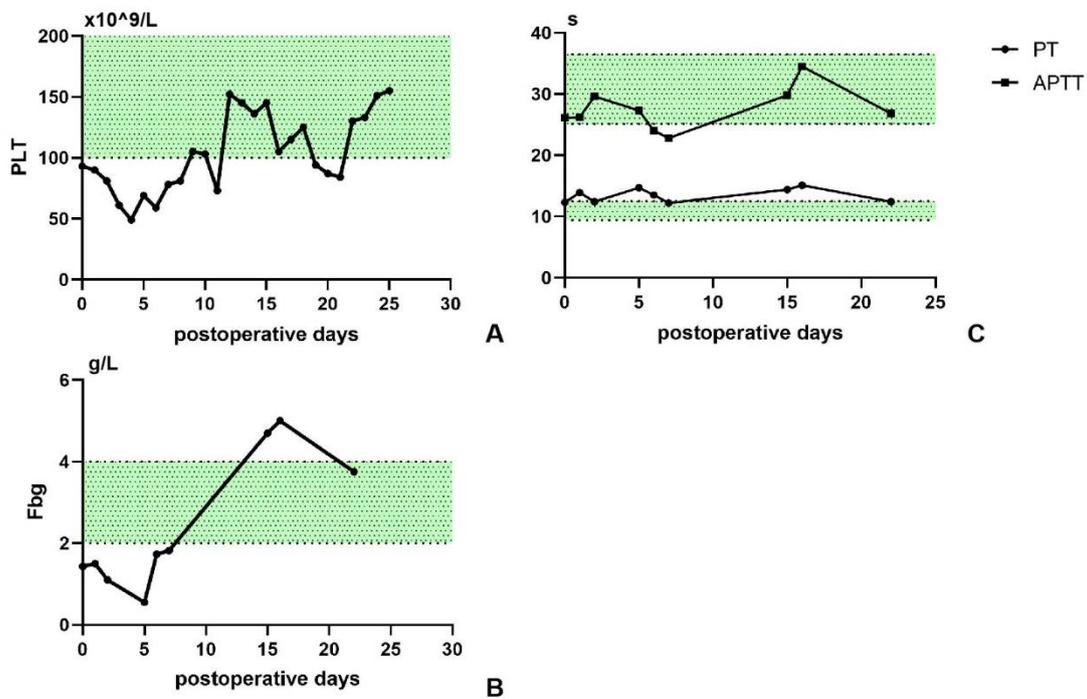


Fig. 2 Platelets declined continuously after surgery and reached a minimum value of  $51 \times 10^9/L$  on the fourth postoperative day (A). fibrinogen reached a minimum value of 0.55 g/L on the fifth

postoperative day (B). Prolongation of PT occurred twice after the operation on the fifth postoperative day and the sixteenth day by 14.7s and 15.1s respectively (C). (the green area: normal range)

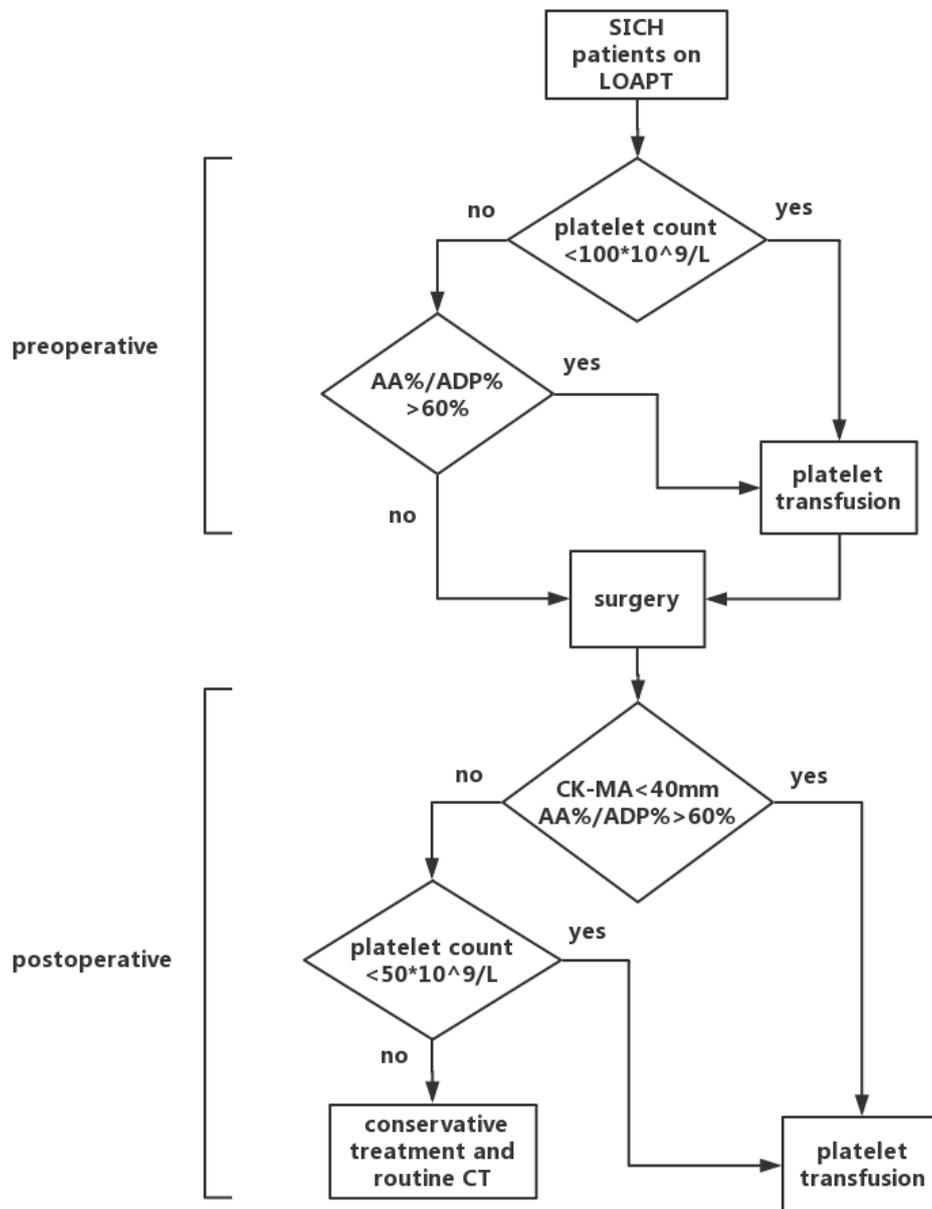


Fig. 3 The surgical decision-making flow chart of SICH patients on LOAPT.