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LETTER TO THE EDITOR (BY INVITATION) - BRAIN TRAUMA

# Response to letter to the editor regarding "A retrospective study of the effect of fibrinogen levels during fresh frozen plasma transfusion in patients with traumatic brain injury"

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Dear Editor,

We thank Wang et al. for their interesting comments on our article, "A retrospective study of the effect of fibrinogen levels during fresh frozen plasma transfusion in patients with traumatic brain injury" [3].

In response, we would like to make several points. First, Wang et al. suggested that the worse outcomes of traumatic brain injury (TBI) patients in the low-fibrinogen subgroup may have resulted from more severe injury, rather than hyperfibrinolysis and hyperfibrinogenolysis, owing to larger hematoma and greater blood loss. We agree that the severity of TBI can correlate with hematoma volume and blood loss. We assessed the intracranial Abbreviated Injury Score (AIS) [1] and performed multivariate logistic regression analysis, including AIS-head as a variable. AIS of acute subdural hematoma, acute epidural hematoma, and intracerebral hematoma/contusion is scored according to hematoma size [1]. We also assessed the volumes of red cell concentrate (RCC) and fresh frozen plasma (FFP) transfused within 3 h of injury and found no significant differences in the transfusion volume of RCC or FFP between the subgroups, indicating that there was no significant difference in injury severity. While we observed hemorrhagic progression in most of the patients with low fibrinogen levels, we could not exclude the influence of surgery or accurately evaluate the relationship between the plasma fibrinogen concentration and hematoma progression. A larger study is required to exclude the influence of surgery and reliably assess the effect of FFP transfusion.

Second, Wang et al. asked whether FFP transfusions themselves can improve outcomes in TBI patients. We performed multivariate logistic regression analysis to identify independent risk factors for poor prognosis in the FFP transfusion group and FFP non-transfusion group, and found that a decreased fibrinogen level 3 h after injury was a significant risk factor for poor prognosis in both groups. We recognize that FFP transfusion, along with fibrinogen concentrate and prothrombin complex concentrate (PCC), is one of the methods used to replenish coagulation factors. Although a number of studies have suggested that the transfusion of large volumes of FFP during early acute resuscitation following trauma is associated with the occurrence of multiple organ failure (MOF) and acute respiratory distress syndrome (ARDS) [5], we found no significant difference in the incidence of MOF or ARDS between the FFP transfusion group and the FFP non-transfusion group.

Finally, Wang et al. recommend the use of fibrinogen concentrate or a combination of fibrinogen concentrate and PCC to restore coagulation factors in TBI patients with hyperfibrinolysis and hyperfibrinogenolysis. As they pointed out, fibrinogen concentrate and PCC have the advantages of short correction time and low fluid volume [2, 4, 6] and may be a better treatment choice for TBI patients. In Japan, fibrinogen concentrate and PCC are not approved for use in patients with traumatic brain injury. As FFP transfusion is approved for this indication in Japan, our study focused on the effect of fibrinogen levels during FFP transfusion.

## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

This article is part of the Topical Collection on *Brain trauma*

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