Progressive Hemorrhagic Injury After Severe Traumatic Brain Injury: Effect of Hemoglobin Transfusion Thresholds

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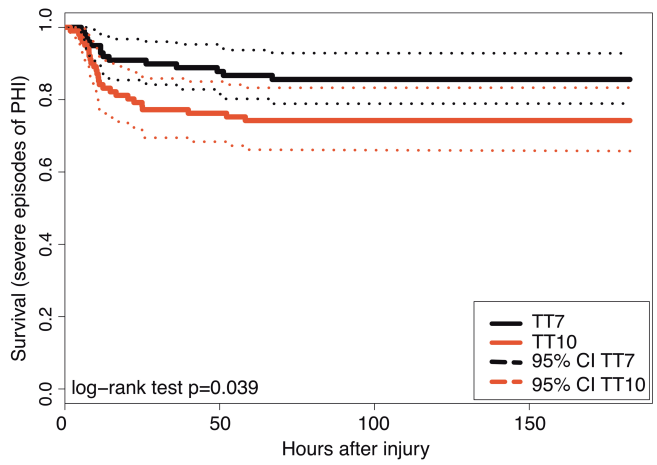
Introduction

There is limited literature available to guide transfusion practices for patients with severe traumatic brain injury (TBI). Recent studies have shown that maintaining a higher hemoglobin threshold after severe TBI offers no clinical benefit. The present study aimed to determine if a higher transfusion threshold was independently associated with an increased risk of progressive hemorrhagic injury (PHI), thereby contributing to higher rates of morbidity and mortality.

Methods

We performed a secondary analysis of data obtained from a recently performed randomized clinical trial studying the effects of erythropoietin and blood transfusions on neurological recovery after severe TBI. Assigned hemoglobin thresholds (10g/dl (n=101) vs. 7g/dl (n=99)) with packed red cell transfusions during the acute phase after injury. PHI was defined as the presence of new or enlarging intracranial hematomas on computerized tomography up to 10 days after injury. A severe PHI was defined as an event that required an escalation of medical management or surgical intervention. Clinical, imaging parameters and transfusion thresholds were used in a multivariate Cox regression analysis to identify independent risk factors for PHI.

Kaplan-Meier curves showing the impact of hemoglobin transfusion threshold on the incidence of severe episodes of PHI



TT7- hemoglobin transfusion threshold of 7g/dl
TT10 – hemoglobin transfusion threshold of 10g/dl

Results

Among 200 patients enrolled in the trial, PHI was detected in 61 patients (30.5%). The majority of patients had a new, delayed contusion (n=29) or an increase in contusion size (n=15). The mean time interval between injury and identification of PHI was 17.2±15.8 hours.

The adjusted risk of severe PHI was 2.3 times higher for patients with a transfusion threshold of 10g/dl (95% CI 1.1-4.7, p=0.02). Diffuse brain injury was associated with lower risk of PHI events, while higher initial ICP increased the risk of PHI (p<0.001). PHI was associated with longer length of stay in the intensive care unit (median 18.3 vs 14.4 days, p=0.04) and poorer Glasgow Outcome Scale scores (42.9% vs 25.5%, p=0.02) at 6 months.

Conclusions

A *higher* transfusion threshold of 10g/dl after severe TBI ***increased the risk*** of severe PHI events. Maintaining a higher hemoglobin transfusion threshold after severe TBI. These results indicate the potential adverse effect of using a higher hemoglobin transfusion threshold after severe TBI.

References

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2. Robertson CS et al. Effect of erythropoietin and transfusion threshold on neurological recovery after traumatic brain injury: a randomized clinical trial. JAMA. Jul 2 2014;312(1):36-47.