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In Reply to the Letter to the Editor Regarding "Viscoelastic Hemostatic Assays and Outcomes in Traumatic Brain Injury: A Systematic Literature Review"

The letter to the editor by Miranda et al.[1] provides a timely and important justification for expanding the utilization of viscoelastic hemostatic assays (VHAs) in the context of blood-product shortages and ongoing humanitarian crises. The authors further highlight the responsibility of neurosurgeons to promote goal-directed blood-product transfusion protocols in order to consider health system implications of transfusion recommendations.

The benefit of VHAs has been demonstrated in fields such as cardiac surgery, transplantation, and trauma surgery. In the randomized trial conducted by Gonzalez et al.,[2] patients were enrolled if they activated the institutional massive transfusion protocol, and in the study by Baksaas-Aasen et al.,[3] patients received the institutional major hemorrhage protocol. These studies provide excellent data and serve to reaffirm the use of VHAs in polytrauma patients, including those with severe traumatic brain injury (TBI). However, the interpretation of these results should be taken in the context of the specific patient population requiring significant transfusion volumes within the first 24 hours. A median of 9.5 units of red blood cells and 5.0 units of plasma were transfused within the thromboelastography group in the study by Gonzalez et al.,[2] while roughly a quarter of all deaths within the VHA group in the study by Baksaas-Aasen et al.[3] occurred secondary to exsanguination.

An increasing number of TBI patients, however, do not have polytrauma requiring massive transfusions.[4] As the population ages, there is a growing emphasis on management algorithms targeted toward individuals who experience isolated TBI in the context of low velocity mechanisms of injury such as falls. Additionally, many of these individuals will have concomitant antiplatelet or anticoagulation use.

Nevertheless, the literature on VHAs in this latter population of TBI patients is expanding. In conjunction with studies conducted on other neurosurgical populations, such as primary intracranial hemorrhage, there is an increasing basis to advocate for the routine use of these assays in all patients with neurologic injury, traumatic, or otherwise.

However, the role of VHAs in patients with anticoagulation and antiplatelet use remains uncertain. The ability of most widely used VHAs (thromboelastography and rotational thromboelastometry) to accurately predict coagulation status in patients on direct oral anticoagulants within the clinical setting is not uniformly reliable.[5-7] This point is important especially with the implementation of either more costly or potentially higher-risk thrombogenic reversal strategies, including coagulation factor Xa (recombinant), inactivated-zhzo (Andexanet Alfa), human fibrinogen concentrate, or prothrombin complex concentrate.

Similarly, there is an expanding yet conflicting literature base that evaluates the use of platelet function assays and platelet mapping in patients with TBI, either as a predictive marker or as a guide to management. Some studies demonstrate an inability to predict mortality or hemorrhagic lesion expansion using these assays.[8-10] In a study of patients taking antiplatelets medications by Alvikas et al.,[11] assay confirmation of platelet inhibition was not associated with poor outcomes. However, a retrospective study by Miles et al.[12] demonstrated an increase in mortality in patients with platelet dysfunction, as well as a decreased need for neurosurgical intervention when mapping values, specifically ADP, improved following platelet administration.

Despite the potential benefit to improve reversal and transfusion stewardship, there is conceivable increase in blood-product utilization in this patient population given the increased sensitivity of VHAs and platelet assays to identify coagulopathy or platelet dysfunction with greater frequency than conventional coagulation assays.

We personally use VHAs in the management of polytrauma and severe TBI patients. Yet, questions remain such as the optimal thresholds for transfusion in this population and if certain differences in laboratory values among groups correspond to the same transfusion thresholds. Furthermore, studies that demonstrate VHA associations with poor outcomes do not necessarily describe proper target levels for intervention, which might prevent these poor outcomes. Further studies and careful recommendations are needed to help guide the use of these evolving assays in patients with TBI.

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