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Changes in PT, APTT and platelet counts after ICH resulting from accidental trauma

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Research Abstract Title

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Describe role of Submitting/Presenting Trainee in this project (limit 150 words): This is my fellowship scholarly work product.

Background, Objectives/Goal, Methods/Design, Results, Conclusions limited to 500 words

Background: Timing alleged cases of abusive head trauma (AHT) is challenging. Changes in prothrombin time (PT), activated partial thromboplastin time (APTT) and platelet counts due to post-traumatic coagulopathy may improve the accuracy of timing the trauma in such cases. In particular, as platelets are both an acute phase reactant and consumed in post-traumatic coagulopathy, changes may be correlated with time since trauma.

Objectives/Goal: Using cases of accidental trauma and intracranial hemorrhage with known timing of injury, we aimed to characterize the temporally related changes in PT, APTT and platelet counts.

Methods/Design: This was a retrospective descriptive study of subjects ages 0-17 years who presented to a pediatric level 1 trauma center during a 4.5 year period. Subjects had known timing of accidental trauma, intracranial hemorrhage identified on CT/MRI, and at least one PT, APTT or platelet count measured. Subjects were excluded if there was a diagnosis of physical abuse, if they had a known bleeding disorder, or if they were taking a daily anticoagulant. Data collected after a patient received platelets or fresh frozen plasma (FFP) was excluded from analysis. Time of injury was assigned using a previously validated tool. Results of PT, APTT, and platelet count were categorized as normal or abnormal based on institutional laboratory normal ranges for age and characterized based on time since trauma.

Results: Of 133 subjects, 110 had at least one PT measurement, 109 had at least one APTT measurement, and 131 had at least one platelet level measurement. Three subjects were excluded due to having platelet transfusion. Data was analyzed based on the first 24 hours after trauma. The specificity (SP) and positive predictive values (PPV) of an elevated PTT for trauma occurring within 4 hours were 97.1% and 90.9%, respectively. For PT, the corresponding SP and PPV were 77.5% and 70% for trauma occurring within 4 hours. In regards to platelets, 14/128 (10.9%) had abnormally low platelet levels at some point within 24 hours of trauma. Eleven of 14 subjects had normal initial platelet levels that changed to low and persisted as abnormal, with this change occurring 4.3-21 hours post-trauma. These subjects had a range of 1-4 blood draws prior to the development of abnormal counts. Four of these 11 subjects had platelet levels that became abnormal beyond 13 hours after trauma. Three of 14 subjects had abnormal initial platelet levels that changed to normal, occurring 5.1-9.2 hours post-trauma. These subjects had 1-2 blood draws prior to the laboratory change.

Conclusions: Elevated APTT and PT had a high PPV and moderate PPV, respectively, for intracranial hemorrhage resulting from accidental trauma occurring within 4 hours prior to measurement. Changes in platelet counts were less frequent overall. There was a wide variability in the timing of laboratory draws, as this was done based solely on clinical indication. Future prospective timed collection of PT, APTT and platelet counts will likely narrow time of laboratory value change after trauma. These laboratory values may have potential to provide useful information regarding timing of AHT.