Consistency and Reliability of Bleeding Disorder Workup in Children with Concern for Physical Abuse

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Introduction

Children presenting with bleeding and/or bruising symptoms can raise concern for child physical abuse. The most common presentations are intracranial hemorrhage and cutaneous bruises, which can be seen in bleeding disorders as well as physical abuse. It is crucial to determine if bleeding and/or bruising is due to child physical abuse or an underlying bleeding disorder. The workup for child physical abuse often consists of a bleeding disorder analysis with coagulation factors, however, traumatic injuries in children can result in abnormal factor levels. Factor VIII and von Willebrand factor have been identified as acute phase reactants, where levels can be increased due to stress, inflammation, acute infection, physical exercise, or following surgery. The inappropriate diagnosis of child physical abuse can cause unnecessary stress for the child and the family, on the other hand, if physical abuse is disregarded as a medical cause this puts the child at risk for future abuse and/or death. Within this study, we set out to see the consistency in bleeding disorder workup for patients with suspected child abuse and the reliability of coagulation tests as a diagnostic measure for bleeding disorders in suspected child physical abuse.

Methods

This is a retrospective chart review performed at a single tertiary pediatric center (St. Christopher's Hospital for Children). This study was reviewed and approved by IRB for waiver of consent and a waiver of HIPAA authorization. Every patient presenting with trauma and/or concern for child physical abuse is evaluated by the Trauma Surgery Team. Given this, data was collected on all blunt trauma patients evaluated by the Trauma Service from Janurary 2021 to December 2022. Data collected included initial coagulation factors (prothrombin time (PT), partial thromboplastin time (PTT), finbrinogen, D-Dimer), initial complete blood count (CBC) initial factor levels, initial physical exam findings, radiographic findings, and follow-up labs when

obtained. Additional parameters collected were highest level of care, length of admission, Glascow Coma Scale (GCS), past medical history, age, and ethnicity/race. Each case was evaluated by study personelle to determine whether patients underwent a workup for bleeding disorders and final suspected or proven diagnosis. Patients were excluded if they were over 18 years old, had a known bleeding disorder, did not experience head trauma, or were deceased on arrival. Statistical analysis was conducted using SPSS software.

Results

140 patients were eligible. The majority were male. 27% patients self-identified as Black race and 43% were Hispanic ethnicity. The average age was 46 months (interquartile range 1 month-17 years). The most common initial diagnosis was child physical abuse (63.5%), followed by blunt head trauma (40%). An initial coagulation panel was obtained in 64% and 63.5% of patients for PT/INR and PTT, respectively (three patients had it drawn over 36-hours after arrival). Bleeding disorder labs were obtained in the following frequencies within 36-hours after arrival: Factor XIII 33.6%, Factor IX 33.6%, von Willebrand Factor 26%, and Factor XIII Ristocetin 25.7%. These labs were more frequently obtained in cases of suspected child physical abuse compared to head trauma patients. The final diagnosis was suspected or proven child physical abuse in 33.6%, other trauma in 64%, and other medical causes in 3% (i.e. benign enlargement of subarachnoid spaces). Across all trauma patients, PT was significantly elevated ($M= 14.78$, $SD= 2.4$) as compared to normal range ($t(92)= 5.024$, $p < 0.001$). PT did not differ significantly based on mechanism of trauma ($t(91)= 1.55$, $p= 0.99$). Mean PTT was normal across all patients ($M= 30.51$ seconds, SD 4.9). Factor XII, Factor IX, and von Willebrand Factor were normal for all trauma patients.

Conclusion

This preliminary data shows there is inconsistency in evaluation for bleeding disorders following head trauma for suspected child physical abuse patients, with basic factor levels and being drawn less than half of the time. Additionally, patients with head trauma may have coagulation dysfunction, in this case PT, without an underlying bleeding disorder. Further research should be conducted to continue to assess the relationship between trauma and abnormal bleeding labs, especially if trying to rule-out bleeding disorders in cases of suspected child physical abuse.

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