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Relationship Between Hemolytic Index Early in Life and Development of Abnormal Transcranial Doppler Velocities in Pediatric Patients with Sickle Cell Anemia

Derrick L. Goubeaux
Children's Mercy Hospital, dlgoubeaux@cmh.edu

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Research Abstract Title

Submitting/Presenting Author (must be a trainee): Derrick L. Goubeaux, DO
Primary Email Address: dlgoubeaux@cmh.edu

Resident/Psychology Intern

Fellow

Primary Mentor (one name only): Gerald Woods, MD
Other authors/contributors involved in project: Ram Kalpatthi, MD, Ashley Sherman

IRB Number: 18010001

Describe role of Submitting/Presenting Trainee in this project (limit 150 words):

I worked along with Dr. Woods and Dr. Kalpatthi to develop the idea for this research project. I then was the primary investigator involved with protocol development and IRB submission as well as any modifications required. I have submitted this project and was accepted for presentation at the American Society of Hematology National Convention in December 2018.

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

Background:

Cerebrovascular disease is a serious complication in sickle cell disease (SCD) associated with a high degree of morbidity and mortality. The utility of transcranial doppler (TCD) ultrasound to measure velocity within major arteries of the brain has been validated as a way to predict those at increased risk for stroke. Hemolysis via a hemolytic index variable has been shown to be associated with complications associated with SCD.

Objectives/Goal:

This study aimed to evaluate an association between a hemolytic index variable (HI) obtained in the first two years of life and development of abnormal or conditional TCD velocities later in childhood in patients with sickle cell anemia (SCA) with thoughts this may provide an earlier tool to determine those who may be at increased risk for stroke prior to either obtaining a TCD or developing an abnormal TCD. The study also aimed to evaluate for an association between HI with other SCD related acute complications, i.e. hospitalization, stroke, acute chest syndrome (ACS)

Methods/Design:

This study was a single-center, retrospective chart review of patients with SCA receiving their disease related care at our center over a 17 year period. Laboratory values, including lactate dehydrogenase (LDH), aspartate aminotransferase (AST), total bilirubin (TB), absolute reticulocyte count (ARC), and hemoglobin (HB), obtained in the first two years of life were extracted; these values were utilized to calculate a

hemolytic index (HI) via principle component analysis. All TCD results and complication history from 2-21 years of age were also extracted from the patient's record. Cox proportional hazards models were then used to determine if the hemolytic index was a risk factor the above.

Results:

A total of 109 patients were included in the analysis revealing Cox regression hazards model utilizing HI revealed a hazard ratio of 1.33 (95% CI 1.04 - 1.70, $p = 0.025$) for developing a conditional or abnormal TCD velocity. HB was then included along with the other four laboratory values for principle component analysis in creation of a hemoglobin HI (HHI) with Cox regression hazards model utilizing HHI revealed a hazard ratio of 1.31 (95% CI 1.04 - 1.66, $p = 0.024$). HI was then evaluated as a predictor for development of stroke or ACS revealing a hazard ratio of 1.21 (95% CI 0.82-1.79, $p = 0.345$) for stroke and a hazard ratio of 1.28 (95% CI 1.04-1.58, $p=0.022$) for ACS.

Conclusions:

This retrospective study noted an increased risk for development of an abnormal or conditional TCD with an increased HI. The addition of hemoglobin to the HI to form HHI showed an elevated risk for abnormal or conditional TCD to the same degree as HI itself. These results could offer an additional tool in the evaluation of the pediatric SCA population, although these results would benefit from a prospective look. Further look into a possible association between HI and other SCD related complications such as stroke and acute chest syndrome could provide further information for the treating team for the overall management of this complex disease.