Therapeutic Plasma Exchange in Critically Ill Pediatric Patients with Leukemia

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IRB Number: myIRB ID- STUDY00001632

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

Myself and my co-Fellow, Chandni Dargan, completed our IRB proposal and performed a chart review along side our co-authors. Following the chart review process, Dr. Gonzalez Dominguez provided a computational analysis, which myself and Dr. Dargan reviewed and pulled out pertinent information to present.

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

Background:

Therapeutic plasma exchange (TPE) has well-documented applications in the adult population, outlined by the American Society of Apheresis (ASFA) 2019 guidelines. Limited data exists regarding the use of TPE in critically ill pediatric patients, however these reports rarely include patients with oncological diseases. Care for these patients poses certain clinical considerations including the safety of continuing chemotherapy, delayed clearance of chemotherapy secondary to end organ damage and mechanical clearance (i.e., continuous renal replacement therapy (CRRT) circuitry), and ability to tolerate chemotherapy once recovered. We aim to highlight the potential benefits of TPE in their acute management, so that it may be recognized as an earlier treatment modality.

Objectives/Goal:

To describe the role of apheresis in pediatric patients with hematological malignancies.

Methods/Design:

Records for 7 pediatric leukemia patients (0-18 years) who received TPE in Children's Mercy Hospital's ICU from 2015-2020 were retrospectively reviewed. Data collected included demographics (including treatment protocol/cycle of treatment), TPE specifications (treatment indication, modality, number of treatments, baseline and interval laboratory evaluation, procedure related complications), duration of time in the ICU, and outcome measures (mortality and ability to resume oncological treatment). Descriptive and survival analyses were performed.

Results:

Our population (mean age 7.43 years, 57.1% female) consisted of 4 patients requiring extracorporeal membrane oxygenation (ECMO) and 6 requiring CRRT. Multi-organ failure (MOF) prompted the initiation of TPE in 85.7% of patients, 42.9% of whom were also diagnosed with hemophagocytic lymphohistiocytosis (HLH). Mean days in the ICU until apheresis initiation was 12.43 (range 1-68 days), not statistically different between those who did (n=4) and did not (n=3) survive 30 days post-TPE. While baseline laboratory evaluation noted similar creatinine, bilirubin, and CRP between the groups, survival analysis noted elevated liver enzymes in those who did not survive 30 days post-apheresis. Analysis of interval labs shows a statistically significant improvement in CRP and lactic acid in those who survived versus did not. Procedure-associated complications included circuit clotting, hypotension, and hypocalcemia; however, apheresis discontinuation was not required in any cases. All living patients were able to continue chemotherapy treatment, however 2 required protocol adjustments for residual decreased organ function.

Conclusions:

Our cohort demonstrated MOF and HLH consistently as indications for TPE, currently AFSA category III indications (optimal role of apheresis is not yet established). Recognition of this treatment modality earlier in the clinical course for critically ill oncological patients may lead to improved outcomes, and a larger cohort study is needed to evaluate this further.