Abstract

Background:

The COVID-19 pandemic has caused an unprecedented global health crisis affecting people around the world. As of January 2022, more than five and a half million people globally have died as a result of the disease. Despite rising vaccination rates, inadequate vaccine access and vaccine hesitancy continue to pose a significant healthcare concern. As a result, effective therapies to treat those affected with COVID-19 are being studied. Convalescent plasma (CP) has been studied as a potential therapy but has mixed results in the literature. Studies supporting CP suggest that timing of treatment and high titer status are important variables. This research aims to contribute to the growing body of literature evaluating whether convalescent plasma is a useful adjunct therapy for those with COVID-19 infection. It will also help identify if high titer CP and/or timing of administration impact mortality, intubation status, or days in the hospital.

Methods:

From September 17, 2020, to February 3, 2021, 1137 individuals with COVID-19 were hospitalized at Poudre Valley Hospital, Medical Center of the Rockies, or Greeley Hospital in northern Colorado. Among these patients, approximately 587 were transfused with either high titer or low titer convalescent plasma. As existing evidence indicates the importance of high titer CP, we compared the primary endpoint of mortality and secondary endpoints of intubation status and days in the hospital between those receiving high titer CP within three days of symptom onset, to those who received high titer CP after three days and those who did not receive CP. Subjects that received low titer CP were excluded. The list of subjects receiving CP and their respective IgG titer levels were obtained through our blood bank (Garth Englund Blood Center), and our control group was populated through EPIC (EMR) during the same time period.

Results:

A total of 238 patients were analyzed in this initial analysis. Of those patients, 138 received high titer convalescent plasma (CPHigh group). In the CPHigh group, 25 received a high titer unit within three days of symptom onset (CP3 group), and 113 received high titer CP after three days of symptom onset (CPLate group). These groups were compared with 100 patients that were admitted with COVID-19 and did not receive CP during the same time period. Analysis of our primary endpoint of mortality in the four groups showed mortality rates of 8% in the CP3 group, 13% in the CPLate group, 12% in the CPHigh group, and 15% in the control group. Mortality data did not result in any statistically significant difference between any of our group comparisons (CP3 vs Control: Odds ratio: 0.49 ($p=0.36$); CP3 vs CPLate: Odds ratio: 0.57 ($p=0.47$); CPLate vs Control: Odds ratio: 0.87 ($p=0.72$); CPHigh vs Control: Odds ratio: 0.80 ($p=0.55$). Evaluation of hospital admission duration resulted in no statistically significant difference between our CPHigh and CPLate vs control group ($p>0.05$) and no difference between our CP3 group and control group ($p=0.49$). Analysis of intubation status of in our CP3 group was 8%, 15% in CPLate, 14% in CPHigh, and 11% in our control group, and resulted in no significant difference between our groups (CP3 vs Control: $p=0.66$; CP3 vs CPLate: $p=0.35$; CPLate vs Control: $p=0.38$; CPHigh vs Control: $p=0.53$).

Conclusions:

The literature surrounding CP use as a treatment for COVID-19 is mixed and controversial, but recent studies have emphasized the importance of using only high titer units early in the disease course. While not statistically significant, there is a positive trend in our results to support the claim that those transfused early have the best outcomes. This is best demonstrated by a 51% lower likelihood of mortality in the CP3 group versus control group, and only a 13% reduction in mortality in the CPLate group versus control group. Additionally, our results highlight the importance of using date of symptom onset, as opposed to admission date, as a critical metric to stratify if a patient will benefit from high titer CP administration in treating COVID-19.