Abstract 

Oxygen Saturation of Collected RBC Products Is Donor Dependent

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Abstract Text:

Background/Case Studies:

Oxygen (O2) is a critical element affecting oxidative damage and metabolic homeostasis of RBCs during long-term storage. O2 content of RBC unit is represented by SO2 (fractional hemoglobin O2 saturation) which varies unexpectedly in freshly prepared RBC units, while factors affecting observed wide distribution are unknown. Initial SO2 affects cumulative O2 exposure and resulting accumulation of oxidative damage as O2 content increase during storage.

Study Design/Methods:

Data for two consecutive donations (84±21 days apart), collected for a pivotal, prospective, randomized, two-arm, crossover, three-center trial, were tabulated (88 pairs). SO2, CBC, blood gas, lactate, glucose, ATP, 2,3-DPG, morphology, volume, total hemoglobin mass/unit as well as donor’s weight, BMI, blood pressure and pulse rate were analyzed for correlations between two donations. Additionally, correlations between difference in the same parameter for two donations were examined. Pearson’s correlation coefficients (R) are calculated for each pair (p < 0.001 for all reported R).

Results/Findings: SO2 showed moderate correlation between two donations (R=0.56) with a slight decrease in the second donation (0.58±0.15 vs. 0.54±0.15, p < 0.03). Hemoglobin mass/unit showed high correlation between two donations (R=0.86). Very high correlations (R > 0.9) were observed for MCV and WBC (pre-leukreduction), while other CBC parameters (MCH, MCHC, RDW, tHb, PLT (pre-filter) showed high correlations (0.7< R < 0.9). ATP levels correlated moderately (R=0.75) while 2,3-DPG showed lower correlation (R=0.49). pCO2 and pH showed moderate correlations (R=0.58, and 0.61 respectively). Positive change in SO2 correlated with negative change in pCO2(R= 0.6). Very high correlations were observed with parameters relating to long-term status of the donors, such as MCV, WBC count, tHb and other CBC parameters. SO2 showed only moderate correlation, suggesting contributions from factors other than donor genetics.

Conclusions:

High correlations were observed between two blood donations 12±3 weeks apart for parameters likely associated with donor’s phenotype. Oxygen content of RBC was affected in part by the short-term donor history and contributed to the unexpectedly wide distribution in O2 content of manufactured RBC units.