Endothelial Dysfunction Precipitated by Transfusion of Storage-Aged but Not Fresh Red Blood Cells

Poster Contributions
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Background: Transfusion of storage-aged (aged) packed red blood cells (pRBCs) is associated with worse outcomes, but the underlying mechanisms remain unknown. We tested endothelial nitric oxide (NO) bioavailability during transfusion of aged and fresh pRBCs with the hypothesis that aged pRBCs will impair endothelial function.

Methods: Forty-three inpatients (aged 59±14 years, 46% female) receiving cross-matched pRBC transfusions for clinical indications were randomized to receive either fresh (aged <10 days, n=19) or aged blood (aged >21 days, n=24). Endothelial function was assessed using flow-mediated dilation (FMD) of the brachial artery before, during, and following (1 hour and 24 hours) transfusion. Data were analyzed with a linear mixed effects model.

Results: There were no differences in demographics, CVD risk factors, known CVD, amount of pRBC transfused, or baseline FMD between groups. Mean age (±SD) of pRBC units was 9.1±3.1 days and 29.8±5.7 days in the fresh and aged groups, respectively. Patients receiving fresh pRBCs had no significant change in FMD. However, FMD significantly decreased by 2.4% (p=0.037) 24 hours after transfusion of aged pRBCs. (Figure 1)

Conclusions: Transfusion of aged, but not fresh blood is associated with decreased vascular NO bioavailability 24 hours post-transfusion. Aged transfusion-induced endothelial dysfunction may contribute to poor outcomes associated with blood transfusion. Strategies to improve NO bioactivity require further investigation.