

Procoagulant Activity of Red Blood Cell-Derived Microvesicles during Red Cell Storage

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Summary

Background: Red blood cells (RBCs) undergo structural and biochemical alterations during storage which are collectively called RBC storage lesion and cause a decrease in RBC recovery and survival. During storage, erythrocytes release an increasing number of microvesicles (MVs) that have key roles in biological processes. We aimed to investigate the procoagulant activity (PCA) of RBC-derived MVs during storage. **Methods:** 20 packed RBCs were stored for up to 42 days. Samples were taken at seven different times and evaluated for the presence of RBC-MVs. MVs were separated, and following filtration flow cytometry was used to characterize RBC-MVs based on the expression of glycoprotein A (Gly.A) and annexin V (AnnV) antigens. The coagulant activity of RBC-MVs was tested by clotting time (CT) and PCA assays. Results were compared before and after filtration. **Results:** Flow cytometry revealed a 17.6-fold increase in RBC-MVs after 6 weeks of storage. Significant correlations were found between AnnV+ MVs and PCA ($r = 0.96$; $p < 0.001$), and CT ($r = -0.77$; $p < 0.001$) which was associated with increased PCA and shortened CT with RBC aging. Filtration of samples efficiently removed MVs ($p < 0.001$) and also reduced in vitro PCA of MVs ($p < 0.001$). **Conclusion:** RBC-MVs are procoagulant (particularly AnnV+ MVs) Reduction of MVs from RBC concentrates may reduce the risk of transfusion-induced thrombotic complications.