Procoagulant Synthetic Platelets To Restore Hemostatic Clot Quality in Platelet Dysfunction Settings

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Excessive hemorrhage is a leading cause of mortality for civilians and military personnel under 50 years of age. The current treatment of donor derived platelet transfusion, is riddled with problems such as short shelf life (5-7 days), limited availability and portability, and risk of bacterial contamination. To this end, procoagulant synthetic platelets (P-SP) designed to improve upon such challenges were manufactured to mimic the adhesion and aggregation functions of natural platelets. The P-SP were improved by enriching the surface with the pro-coagulant anionic phospholipid phosphatidylserine (PS). As the enriched P-SP aggregated at the wound site, it was predicted that this enrichment would increase coagulation as the exposure of PS would result in thrombin amplification and enhanced generation of fibrin from fibrinogen, both of which promote hemostasis. Using Rotational Thromboelastometry (ROTEM) technology, whole human blood was mixed with both procoagulants (ETEM and STARTEM) as well as clot-inhibiting drugs such as aspirin, clopidogrel, and vorapaxar, all in the presence of saline. Coagulation was then measured by an immersed pin's rotational resistance in the blood mixture. Resistance increased with added PS, suggesting that P-SPs enriched with PS function are a potential substitute for platelets and should be further considered for combating excess hemorrhage.

Awards Won:

Third Award of $1,000