

PhD DEFENCE Thursday, March 30th, 2017

Student: Ahmad Arbaeen

Title: IMPROVEMENT OF QUALITY STANDARDS FOR BLOOD TRANSFUSIONS: USE OF FUNCTIONAL MEASURES TO PREDICT PLATELET TRANSFUSION EFFICACY

Time and location: 12:30pm PST; Room 203 of the Graduate Student Centre (6371 Crescent Road), UBC Vancouver Point Grey Campus

Supervisor: Dana Devine

ABSTRACT

Transfusions of platelet concentrates (PCs) are given to maintain primary hemostasis in patients with various thrombocytopenic disorders. There is poor correlation between in vivo PC transfusion outcome and in vitro tests, which typically do not test the functional effectiveness of platelets, but rather measure platelet characteristics. Thus, the PC quality assay that would accurately predict transfusion efficacy should test the efficacy of platelet activation and clot formation in a manner that more closely models these same processes in the bloodstream.

The first aim of this thesis is to determine whether Thromboelastography (TEG)/rotational Thromboelastometry (ROTEM) technologies involving global hemostatic analyzers could be used to assess the quality of PCs under a variety of conditions. Due to their procoagulant properties, platelet microvesicles' (PMVs') contribution to the clot signature was assessed.

The second aim was to investigate the effect of pathogen inactivation technology (PI) using riboflavin/UV light (Mirasol) on the hemostatic potential of PCs and plasma in transfusion trauma packages composed of reconstituted whole blood (WB). The packages were composed of red blood cells (RBC), plasma, and platelet, in a ratio of 1:1:1.

As there is an increasing interest by practitioners in returning to the use of WB (2-7 days old) in the civilian setting for the treatment of massively hemorrhaging patients, our third aim was to determine whether ROTEM could be used to assess the impact of PI-treated WB in a trauma model. Due to the reduction in the activity of multiple plasma coagulation proteins following PI-treatment, supplementation of fibrinogen to correct the negative impact was assessed.

Hemostatic analysis showed no significant change in maximum clot formation during the storage of PCs up to Day 10. Hemostatic measurement was sufficiently sensitive to dissect platelet and PMV contributions to clot formation and to detect PCs stored under poor conditions. This study suggests a potential solution to the apparent reduction in the hemostatic capability of blood products as caused by treatments with Mirasol; the use of fibrinogen supplementation appears to largely correct the Mirasol defect.