Proceeding

The Development of Random Platelet Concentrates (PC) in Platelet Additive Solution (PAS). Blood Transfusion Centre. Faculty of Medicine Khon Kaen University, Thailand.

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Background and Objective: Platelet additive solutions (PAS) are crystalloid nutrient media used in place of plasma for platelet storage. They replace 60-70% of plasma in platelet components. So the amount of storage plasma can be decreased. Platelet stored in PAS have been demonstrated to have a lower risk for allergic transfusion reactions and appeared to have equivalent clinical efficacy for controlling bleeding, compared to platelets stored in 100% plasma and increase storage time to 7 days with bacterial detection test and due to decrease in the titer of ABO agglutinins, platelets in PAS do not require ABO compatibility between donor plasma and recipient cells or use as universal platelet. The separation of random platelet concentrates (PC) from whole blood is base on the differential densities of various cellular components when blood is subjected to variable centrifugation forces. The problem in our routine work is 3.8% of PC showed no swirling features before 5 days. This study aimed to prepare PC in PAS in our routine work, instead of the traditional PC.

Methods: Whole blood (WB) was high-speed centrifuged before separation by automated system. PC was prepared by an alternative approach involved PC preparation from a single buffy coat (BC) unit by adding approximately 50-70 ml of plasma/PAS before centrifugation, followed by transfer of the PC to a 300 ml transfer bag and stored in a flat agitator at 20-24°C for up to 5 days after collection and observed the swirling every days. The PC were measured volumes, residual leukocyte and platelet content. The pH was determined on day 6 at 20-24 °C.

Results: Random PC in traditional method (n=31) had the mean of volume 51.3 ml and platelet yields $9.4X10^{10}$ cells/unit. Compared to the PC in PAS (n=43) had the mean of volume 62 ml and platelet yields $7.2X10^{10}$ cells/unit. 100% of PC in PAS increased storage time to 7 days and the mean of pH 6.72 while the traditional PC had storage time only 4 days and the mean of pH 5.69.

Conclusions: PC in PAS increased storage time to 7 days 100% and provides reached the recommended quality of Council of Europe (EU), American Association of Blood Banks(AABB) and

National Blood Centre, Thai Red Cross Society (TRC);random PC had content more than 5.5X10^{10} cells/unit, volume 50-70 ml, pH>6.4.

Keywords: Random platelet concentrates (PC), Platelet additive solutions (PAS)

Introduction

Platelet additive solutions (PAS) have been used to store platelets since the 1980s.[1,2] PAS storage of pooled buffy coat prepared platelet concentrates (PC) have long been used in Europe.[3] The advantages of using PAS for platelet storage are many including more plasma to meet patient needs or to fractionate into plasma-based products, reduced red cell hemolysis from ABO incompatible plasma and reduce other adverse effects related to plasma transfusion[4-6]. Reduction in plasma volume with anticipated benefits in reduced allergic reactions, and possibly transfusion-related acute lung injury (TRALI).[7]

PAS compose of citrate, acetate, phosphate, magnesium, potassium and gluconate. Each type of PAS, these components will be different. PAS has been used as a platelet storage medium in apheresis platelets and buffy coat-derived platelets. It is not only used, but used in combination with plasma. The propotion of plasma range from 20 to 50% and PAS 50 to 80%.

The advantages of PAS are improve the efficiency of platelet collections: additional volume for more collection, maximize the capability to collect multiple blood components, facilitate pathogen inactivation, increase storage time to 7 days with bacterial detection test and due to decrease in the titer of ABO agglutinins, platelets in PAS do not require ABO compatibility between donor plasma and recipient cells or use as universal platelet.

The separation of random PC from whole blood is base on the differential densities of various cellular components when blood is subjected to variable centrifugation forces. The problem in our routine work is 3.8% of PC showed no swirling features before 5 days.

The objective of this study was to prepare PC in PAS in our routine work, instead of the traditional PC.

Method

Whole blood (WB; 450$\pm$10% ml.) was high-speed centrifuged at 3,500 rpm, 22 °C, 10 minutes (Heraeus Cryofuge 6000i, 8500i) before separation by semi-automated system. Buffy coat was separated for 30-35 ml packed. PC was prepared by adding 50-70 ml of plasma/PAS before low-speed centrifugation at 750 rpm, 22 °C for 7 minutes on the next day and transferring the supernatant PC to a 300 ml platelet storage bag and stored in a flat agitator at 20-24 °C for up to 5 days after collection. Weights, platelet yields were measured and volumes were calculated based on specific gravity. For counting residual leukocytes were performed by automate; Mythic 22 hematology analyzer. The platelet swirling was observed every day and the pH was determined on day 6.

Results

Table1: Random PC in traditional method (n=31) had the mean of volume 51.3 ml and platelet yields 9.4X10^{10} cells/unit. Compared to the PC in PAS (n=43) had the mean of volume 62

ml and platelet yields 7.2X10^{10} cells/unit(Table 2). 100% of PC in PAS increased storage time to 7 days and the mean of pH 6.72 while the traditional PC had storage time only 4 days and the mean of pH 5.69.

Table 1 CBC results in PC (traditional method)

N = 31	Plt. Conc. X 10^{10}/U	WBC X 10^{9}/U	RBC X 10^{6}/U	Compare to STD PC/U
X	9.40	0.05	0.00	1.71
SD	0.48	0.01	0.00	0.09

Table 2 CBC results in PC (with PAS)

N = 43	Plt. Conc. X 10^{10}/U	WBC X 10^{9}/U	RBC X 10^{6}/U	Compare to STD PC/U
X	7.23	0.02	0.00	1.31
SD	1.64	0.01	0.00	0.30

Table 3 The criteria of quality control in blood components and KPI for our Blood Transfusion Centre

Component (Standard References)	Quality control	Target Value	Key Performance Indication (KPI)
Random Platelet concentrates: PC (AABB,TRC)	Volume =	50 -70 *ml.*	≥ 90%
	Total platelet count =	≥ 5.5 x 10^{10}cells /unit	
	Red blood cell contamination =	< 1.2 x 10^{9}cells/unit	
	Residual leukocyte=	< 0.12 x 10^{9}cells/unit	
	pH =	≥ 6.2 in the end of storage	

Discussion

The volumes of PC from traditional method less than PC in PAS and the white blood cell contamination more than PC in PAS, too. Statistical tests showed that there were difference in platelet yields, volumes and white blood cells contamination from the two methods($p<0.05$). But, when compare to the standard PC, there were non-significant difference in the contents of platelet concentrates between the two methods ($p>0.05$). However, the platelet yields , volumes, red blood cells and white blood cells contamination from the traditional method and PC in PAS provides reached the recommended quality of Council of Europe (EU), American Association of Blood Bank(AABB) and National Blood Centre, Thai Red Cross Society (TRC);(Table 3).

Conclusion

PC in PAS increased storage time to 7 days and the mean of pH equal 6.72 while the traditional PC had storage time only 4 days and the mean of pH equal 5.69 and provides reached the recommended quality of EU, AABB TRC.

Reference

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