



-80°C Frozen platelets are activated compared to 24 hour liquid stored platelets and quality of frozen platelets is unaffected by a quick preparation method (15 min) which can be used to prepare platelets for the early treatment of trauma patients in military theatre.

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Background

Early transfusion of (frozen) platelets, plasma and red blood cells is associated with improved survival of (military) trauma patients with massive blood loss. Standard frozen platelets (DTC0) are available within 50 minutes whereas plasma and red blood cells are immediately available from the refrigerator. To shorten preparation time and improve platelet availability, 4°C stored thawed plasma was tested for resuspension of the platelets after thaw (DTC7). Product quality of this more rapid preparation method was compared to DTC0 and 24 hr 22°C liquid stored platelets (ATC) to evaluate if DTC7 can be implemented complementary to DTC0 in the -80°C NLD military blood supply system.

Methods

To leukodepleted, O RhDpos/neg apheresis platelet units (ATC), DMSO was added (final conc. $\pm 5\%$). The product was concentrated ($\pm 14\text{ml}$) and frozen to -80°C (Valeri method, DTC). FFP (male apheresis leukodepleted AB -30°C frozen plasma) was thawed, repacked and frozen to -80°C (DFP). DFP was thawed (40 min) and used (DTC0), or stored for 7 days at 4°C warmed (5min) and used (DTC7), for resuspension of thawed (5min) DTC. Platelets (DTC0 N=6 DTC7 N=6) were double stained with Anti-GP2b3a/AnnexinV or with Anti-GP2b3a/Anti-GP1b and measured by flowcytometry. Platelets and platelet microparticles (GP2b3a positive) were gated on the forward/side scatter (ATC < 1% microparticles). Platelets (ATC N=8, DTC0 N=27, DTC7 N=25,) were diluted to $2.0 \times 10^{11}/\text{L}$ in pooled DFP and coagulation profile was measured in TEG (calcium and kaolin).

Results

After thaw or warming of DFP and DTC to 30°C, the platelets were resuspended in the plasma (9 min with administration time) and ready for transfusion. The shorter production time (15 ± 2 min vs 49 ± 5 min) did not influence product content (2.7 ± 0.4 vs $2.8 \pm 0.5 \times 10^{11}$ /unit), freeze-thaw recovery (73 ± 7 vs $73 \pm 11\%$) or pH (7.4 ± 0.1 vs 7.4 ± 0.04). Both DTC0 and DTC7 are GP2b3a positive, express GP1b ($96 \pm 5\%$ vs $95 \pm 5\%$), AnnexinV binding sites ($12 \pm 2\%$ vs $14 \pm 4\%$) and formed microparticles (13 ± 5 vs $14 \pm 5\%$). Compared to ATC, both DTC0 and DTC7 show a significant ($P < 0.05$ Ttest) lower clot strength (MA 65 ± 3 vs 42 ± 6 , 43 ± 5 cm), faster onset of clotting (R time 7.3 ± 0.7 vs 4.0 ± 0.6 , 4.3 ± 0.5 min) and faster clot development (Angle 69 ± 2 vs 74 ± 3 , $73 \pm 4^\circ$) in TEG. As no significant differences in the quality of DTC0 or DTC7 were observed, DTC7 was implemented complementary to DTC0 in Nov'11. From Nov'11-Feb'12, 3 patients were treated (16 DTC0, and 1 DTC7 in 4 day 4°C stored plasma). As with DTC0 (1081 transfused Nov2001-Feb2012), no transfusion reactions were reported.

Conclusions

Frozen platelets are activated, clot strength is reduced, onset of clotting and clot development is faster compared to fresh platelets. Frozen platelets can be prepared within 15 minutes without quality loss compared to the standard 50min procedure and can be used in the early resuscitation of (military) trauma patients.