Hyperosmolar reconstituted lyophilized plasma is an effective low-volume hemostatic resuscitation fluid for trauma.


BACKGROUND: We performed this study to optimize reconstituted lyophilized plasma (LP) into a minimal volume fluid that provides effective hemostatic resuscitation for trauma while minimizing logistical limitations.

METHODS: We performed a prospective, blinded animal study. Plasma was lyophilized following whole blood collection from anesthetized swine. The minimal volume needed for reconstitution was determined, and this solution was evaluated for safe infusion into the swine. Reconstituted LP was analyzed for electrolyte content, osmolarity, and coagulation factor activity. Twenty swine were anesthetized and subjected to a validated model of polytrauma and hemorrhagic shock (including a Grade V liver injury), then randomized to resuscitation with LP reconstituted to either 100% of the original plasma volume (100%LP) or the minimal volume LP fluid. Physiologic data were monitored, and blood loss and hematocrit were measured. Coagulation status was evaluated using thrombelastography.

RESULTS: The minimal volume of reconstituted LP safe for infusion in swine was 50% of the original plasma volume (50%LP). The 50%LP had higher electrolyte concentrations, osmolarity, and increased coagulation factor activity levels by volume compared with 100%LP (p < 0.05). Blood loss, hematocrit, mean arterial pressure, and heart rate did not differ between animals receiving 100%LP (n = 10) or 50%LP (n = 10) at any time point (p > 0.05). International normalized ratio and thrombelastography parameters were not different between groups (R time, θ angle, or maximal amplitude, p > 0.05).

CONCLUSION: Resuscitation with 50%LP fluid was well tolerated and equally effective compared with 100%LP, with respect to physiologic and hemostatic properties. The smaller volume of fluid necessary to reconstitute hypertonic LP makes it logistically superior to 100%LP for first responders and may reduce adverse effects of large-volume resuscitation.