Porcine Model of Trauma with Non-compressible Hemorrhage for Pre-hospital Survival Studies

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Background. The lack of a well standardized animal model of trauma with hemorrhagic shock focused on pre-hospital survivability and morbidity is a major capability gap to test efficacy of new pharmaco-therapeutic approaches of severe battlefield casualties.

Methods. Pre-pubertal Yorkshire crossbred swine were subjected to instrumented without hemorrhage (Sham, n=3), controlled hemorrhage (31%), 30-minute shock period, splenic injury (H+Spl, n=12), and H+Spl with Voluven resuscitation at 15ml/kg after 30min of spleen injury (H+Spl+Voluven, n=5). Systemic complement activation, cytokine, and blood gas analysis, as well as physiological and morphological changes were examined.

Results. The mean survival was 113 minutes in the H+Spl group, whereas Voluven resuscitation prolonged animal survival (mean survival 257 minutes; Figure 1). Blood level of C3a, IL-6 and lactate increased in the H+Spl group, whereas Voluven resuscitation decreased C3a and lactate levels (Figure 2), but no improvement on IL-6 and tissue injury was observed.

Conclusions. This porcine hemorrhagic shock model is suitable for the evaluation of early administration of pharmaco-biologic new small-volume therapeutic intervention aimed at prolonging survival during delayed evacuation.