Background

- Hemorrhage and traumatic brain injury (TBI) are the leading causes of death in civilian and military settings.
- Prolonged Casualty Care (PCC) is a strategic paradigm shift due to changes in future warfare.
- PCC aims to deliver up to 3 days of field care prior to evacuation.
- We have an established porcine model with hemorrhagic shock and TBI, this model has not been tested in the PCC setting.

Objective

Develop a reproducible model of hemorrhagic shock and TBI to test novel therapies in PCC.

Methods

- Designed to test novel therapies.
- Two models of combined hemorrhagic shock and TBI were tested (Table 2).
- Yorkshire swine, 40-45kg.
- Anesthetized and instrumented.
- Damage Control Resuscitation - controlled resuscitation with 250cc bolus over 15 min.
- Extubation criteria:
  - Systolic blood pressure 80mmHg for 1 hour.
  - Maximum fluid volume (100ml/kg).
- 72-hour observation simulating austere PCC setting.
- Blood transfusion simulating transfer to higher level of care.
- End point - 76 hours.
- Outcomes:
  1. Fluid resuscitation requirements.
  2. TBI brain lesion size.
  3. Neurologic Severity Score.

Results

- Survival model requires a strong culture of collaboration with veterinary and husbandry staff.
- Following mortality rate in Model 1, Model 2 was developed to create a severe yet survivable model.
- Mortality rates 41.7% (5/12) vs 11.1% (1/9) in Model 2.
- Model 1, 2 animals died intra-operatively, 3 died in the early-post-operative period.
- Significantly higher peak lactate in Model 1 (Figure 2).
- Majority of animals (4/5) with lactate>5.5mmol at time of extubation died.

Future & Ongoing Work

- Continue work using the model to test the effects of VPA on hemorrhagic shock and TBI.

Conclusions

We have developed the first large animal model of hemorrhagic shock and TBI in a simulated PCC setting. This model is clinically relevant, reproducible, and suitable for testing novel treatments for battlefield use.

Reference