Acute Coagulopathy of Trauma

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**Background:** Acute Coagulopathy of Trauma (ACOT) has been described clinically as an early hypocoagulopathic state and has been reported in prehospital patients with severe trauma and hemorrhage as an elevation in Prothrombin Time (PT).

**Purpose/Aims:** To study this phenomenon, we developed a rat model of polytrauma and hemorrhage that would develop an ACOT.

**Methods:** Sprague-Dawley rats (300-400g) were anesthetized with isoflurane. Polytrauma was induced by 1) crushing 10cm of small intestines, 2) crushing the right and medial liver lobes, 3) crushing the skeletal muscle of the right leg, and 4) breaking the right femur. The rats were bled to a MAP of 40mmHg until 40% of the blood volume was removed. Hemorrhage was usually completed between 30-60 min. No fluid resuscitation was given. Rats (n=7-9/group) were euthanized before (time 0) and at 30, 60, 120, 180 and 240 min after trauma, and blood samples taken for measurement of coagulation parameters (ROTEM) and blood chemistry (I-STAT).

**Data Analysis:** All data was analyzed by 1-way ANOVA.

**Results:** PT rose significantly over time to peak at 180 and 240 min recapitulating ACOT. Plasma lactate was significantly increased, and bicarbonate and base excess significantly fell at all time points post-trauma. Plasma K⁺ was significantly elevated. Thromboelastometry (Extem) showed a significant decrease in Mean Clotting Firmness at 180 and 240 min. However, clotting time was significantly shortened. Alpha angle was significantly increased at 30, 60, 120 and 240 min. Platelet function was initially elevated, but fell below control by 3-4 hrs. There was a rise in (almost) all pro-inflammatory and anti-inflammatory cytokines measured, as well as chemokines and growth factors.

**Conclusion:** We have successfully created a rat model of ACOT (hypocoagulation) as evidenced by a steady elevation in PT and a decrease in clot firmness over time. This model also showed a paradoxical shortening of clotting time and an elevation of alpha angle, suggesting an element of hypercoagulability. The severity of trauma was evidenced by the elevation in plasma lactate and K⁺, and a fall in bicarbonate and base excess. This model of ACOT shows that the initiation of clotting is faster (clotting time and α angle), however the strength of the clot is decreased. This appears to be largely due to changes in platelet count and function. ACOT is associated with a large and complex inflammatory response.

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