An Experimental Model of Hemothorax Autotransfusion: Impact on Coagulation

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Background: Traumatic hemothorax (HTX) has been demonstrated to predictably contain low fibrinogen, low hematocrit, and low platelet counts. When analyzed on its own, shed HTX demonstrates coagulopathy. However, when mixed with normal pooled plasma (NPP) at physiologically relevant dilutions, HTX demonstrates accelerated coagulation. We hypothesize that when HTX is mixed with the patient’s own plasma, the mixture will demonstrate hypercoagulability. The accelerated coagulation of this mixture would have important implications for the autotransfusion of HTX as a method of resuscitating a trauma patient.

Methods: Adult trauma patients from whom >140mL of HTX was evacuated within 1 hour of tube thoracostomy were included. HTX was sampled at 1, 2, 3, and 4 hours after evacuation. A portion of each sample was centrifuged as frozen plasma for later analysis. The sample collected at 1 hour was analyzed (coagulation, hematology, electrolytes), and values were compared to concurrent venous values extracted via chart review. A discarded citrate tube containing the patient’s venous blood was spun down and frozen for later analysis.

Coagulation was further evaluated by mixing serial dilutions of the previously frozen HTX with NPP. Additionally, the previously frozen HTX was mixed in serial dilutions with the previously frozen sample of patient plasma (PP).

Results: Subjects (10) were enrolled based on inclusion criteria and collection of a discarded venous sample. In HTX samples analyzed alone, no thrombus was formed in any coagulation test (aPTT >180). The average aPTT of PP alone was 26.57. In 1 hour specimens mixed at a clinically relevant dilution of 1:4, HTX mixed with NPP had an average aPTT of 26.24, whereas HTX mixed with PP had an average aPTT of 22.4. Thus the mixture of HTX + PP demonstrated a statistically significantly lower aPTT than the mixture of HTX + NPP (p = 0.003). Additionally, the mixture of HTX and PP shows a statistically significantly lower aPTT value than PP alone (p = 0.03), indicating a hypercoagulable state.

Conclusions: HTX demonstrates coagulopathy when analyzed independently, but is hypercoagulable when mixed with NPP or patient plasma. Further, the mixing studies show a statistically significantly lower aPTT when HTX is mixed with patient plasma vs. HTX mixed with NPP. Thus, autotransfusion of HTX would likely produce a hypercoagulable state in vivo, and should not be used in place of other blood products to resuscitate a trauma patient. The autotransfusion of HTX may, however, be of use in a resource-limited environment where other blood products are not available.