**N-Acetylcysteine Improves Renal Microvascular Blood Flow in a Rat Model of Polytrauma**

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*Background.* Microvascular blood flow (MBF) is an important measure of organ perfusion in critical illness. MBF derangement after trauma is associated with organ dysfunction, coagulopathy, and death. The mechanisms causing this derangement are not well-defined, but systemic microvascular thrombosis has been implicated as a possible cause. Severe trauma leads to oxidative conditions in the blood, and oxidative modifications of several key hemostatic proteins can promote off-target thrombus formation. We hypothesized that the antioxidant agent N-acetylcysteine (NAC) could reverse these effects and improve renal MBF after injury in a rat model.

*Methods.* Nine male Sprague-Dawley rats were anesthetized, ventilated, and cannulated. Contrast-enhanced ultrasound measurements of uninjured kidney were taken at prespecified timepoints by destruction-replenishment quantification. Rats were subjected to a standardized polytrauma and catheter hemorrhage to a target mean arterial pressure of 30 mmHg, which was maintained for 60 min. Rats then received either shed blood transfusion alone (Control group, n=6) or infusion of 150 mg/kg NAC followed by shed blood transfusion (NAC group, n=3). Comparison of MBF at each timepoint was performed by two-tailed t-test with unequal variance and significance at *p*<0.05.

*Results.* Mean MBF was similar between NAC and Control groups at baseline (24.3 vs. 31.8 AU, *p*=0.139) and end of shock period (16.2 vs. 10.3 AU, *p*=0.551). However, at 60 min after resuscitation, mean MBF was significantly higher in the NAC group compared to controls (34.9 vs. 20.8 AU, *p*=0.023). This effect was not explained by differences in mean arterial pressure, which were similar between groups at all timepoints.

*Conclusion.* NAC improved renal MBF in this rat model of polytrauma. This confirms that oxidative stress plays a role in MBF impairment after trauma and identifies an early possible therapeutic target for improving MBF. However, NAC is a nonspecific antioxidant, and further investigation is needed to define the pathways involved.