Early Total Care Associates With Improved Organ Function in Polytraumatized Patients Presenting in Hemorrhagic Shock

Greg Gaski, MD; Prism Schneider, MD, PhD; Katherine Frey, PhD; Renan Castillo, MS; Timothy R. Billiar, MD; Robert V. O'Toole, MD; Reza Firoozabadi, MD; Laurence B. Kempton, MD; Stephen Warner, MD, PhD; William T. Obremskey, MD, MPH, FIOTA; Arun Aneja, MD, PhD; ***Todd O. McKinley, MD****; METRC*

Purpose: Titration of orthopaedic interventions for patients with polytrauma affects outcomes. Early total care ([ETC]; definitive fixation <36 hours after injury) is typically beneficial but can be detrimental in under-resuscitated patients. Here we report clinical outcomes in patients who presented in hemorrhagic shock (maximum Day 1 [D1] lactate >4) who were treated with ETC or damage control orthopaedics (DCO).

Methods: In total, 322 patients with polytrauma admitted to the ICU with a Glasgow coma scale (GCS) >8 who sustained surgical injuries to the pelvis, acetabulum, femur, or diaphyseal tibia were prospectively enrolled. We measured Marshall Organ Dysfunction Scores (MODS) daily from D1 to D7 for clinical outcomes. We have shown that an average MODS from days 2 to 5 (aMODSD2-D5) >3 had significantly worse outcomes (ventilation days; complications) and aMODSD2-D5 was our primary outcome. Daily MODS and aMODSD2- D5 were compared (t-tests) between patients treated with ETC versus DCO in those with D1 lactate >4 (n = 93; 24 ETC vs 69 DCO); D1 lactate >4 and injury severity score (ISS) >25 (n = 56; 12 ETC vs 44 DCO); and D1 lactate >4 and total transfusion volume (packed red blood cells, plasma, platelets) <3000 mL (n = 69; 21 ETC vs 48 DCO).

Results: In patients with D1 lactate >4, aMODSD2-D5 was 3.9 in DCO patients versus 1.9 in ETC patients ($p<0.001$). Likewise, aMODSD2-D5 was 4.4 in DCO versus 2.6 in ETC patients with D1 lactate >4 and ISS >25 ($p = 0.023$). In patients with D1 lactate >4 with <3000 mL transfusion volume, aMODSD2-D5 was 3.3 in DCO versus 1.8 in ETC patients ($p = 0.003$). Daily MODS demonstrated that divergence in organ dysfunction trajectories between ETC and DCO patients occurred between 24 hours and 72 hours after injury and primarily resulted from improvements in pulmonary and hematologic function in ETC patients.

Conclusion: In patients with polytrauma with D1 lactate >4, ETC was associated with distinct improvements in pulmonary and hematologic function that led to improvements in overall organ function.