Systemic Inflammatory Response Syndrome in Multiply Injured Children and Adolescents: Are Kids More Resilient?

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Purpose: Systemic inflammatory response syndrome (SIRS) is a well-recognized phenomenon in adult trauma populations. The "initial hit" of the traumatic event is often coupled with a systemic immune response characterized by changes in vital signs and laboratory indicators. A "second hit" from surgery during this time frame often results in acute lung injury (ALI), along with deterioration of the patient's clinical condition. "Damage control orthopaedics" (DCO) was born out of a desire to temporarily stabilize fractures in order to decrease the rate of ALI. While children are also involved in polytrauma, ALI has not been observed at the same rate and extent as it is in adults. This study sought to characterize the SIRS response in children and adolescents, and identify the differences between this population's response and the historical response of adults.

Methods: We queried the trauma database of our Level I pediatric trauma center from January 2005 to December 2015 for patients with ISS >16 and age >2. The electronic medical record (EMR) for these patients was followed for the first 4 days of their injuries and their SIRS criteria were tracked. Additionally, the patients were subcategorized into major orthopaedic injuries (femur fractures, pelvis or spine fractures), and patients without such injuries as well as by age. A total of 294 patients met inclusion criteria. The average ISS was 26.1 ± 9.2.

Results: 81.4% (in the orthopaedic injury group) and 69.1% (in the non-orthopaedic injury group) reached the threshold for SIRS within their first 4 days of hospitalization. Nine patients died in the hospital. Only 2 of the patients with major orthopaedic trauma developed the criteria for ARDS (acute respiratory distress syndrome). Increasing age groups showed increasing proportion of SIRS patients; in age group 2-5 years, 61.7% met SIRS criteria during their hospitalization, whereas in 6-12 there were 72.9%, and in the 13-18 years group there were 82.4%. Increasing ISS and increasing age were independent predictors of SIRS during the hospital stay.

Conclusion: SIRS appears to be as common in children as the reported rates in adults. The proportion of SIRS in children increases with increasing age and injury severity. The high mortality rate and rate of ARDS observed in adults was not present in our cohort.