Significant Loss of Skeletal Muscle Mass Occurs After High-Energy Polytrauma in Young Adults

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Purpose: Significant loss of skeletal muscle mass occurs early after high-energy polytrauma, leading directly to prolonged functional limitations. As we investigate rehabilitative and nutrition interventions to reduce loss of muscle mass, we need to quantify changes in muscle mass after these devastating injuries. The aim of this study was to characterize baseline nutrition status and changes in muscle mass after high-energy polytrauma in a young adult population.

Methods: We enrolled patients 18 to 55 years old indicated for operative fixation of either an open pelvic or extremity fracture, or ≥2 pelvic and/or extremity fractures due to a high-energy mechanism. Baseline assessment of body composition (lean body mass [LBM], skeletal muscle mass [SMM], body fat percent [BFP]) was measured within 72 hours of admission using multifrequency bioelectrical impedance analysis (BIA) and repeated 6 weeks after injury. Results are reported as median (interquartile range). Changes in body composition measures were evaluated using Wilcoxon signed rank tests. Prevalence of sarcopenia was defined as an appendicular skeletal muscle mass index (ASMI) <2 standard deviations below a young adult reference group (<6.3 ASMI for females and <8.5 ASMI for men). Nutrition status at hospital admission was evaluated using food frequency questionnaires. Inadequate protein intake was evaluated using the estimated average requirement (EAR) cut-point method, while inadequate caloric intake was classified as intake below basal metabolic rate.

Results: 16 subjects (14 male) age 38.4 ± 9.6 years were enrolled. The prevalence of inadequate protein and caloric intake was 3/16 and 5/16, respectively. Six weeks after injury participants experienced significant losses in LBM (–4.5 kg [–8.8 to –1.4], P = 0.019) and SMM (–3.1 kg [–5.6 to –0.3], P = 0.043), as well as significant increases in BFP (6.7% [2.3 to 9.3], P = 0.044). The injured extremity had significantly greater loss of lean mass compared to the uninjured extremity (–4.0 [–17.1-3.5], P = 0.0495). Five participants (31%) were baseline sarcopenic and 1 additional participant met the criteria for sarcopenia by 6 weeks. Baseline protein and calorie deficiency were not significantly associated with muscle loss.

Conclusion: This study documented devastating loss of lean body mass and skeletal muscle mass after high-energy polytrauma in young adults. These losses are likely a combination of immobilization and catabolic response for wound and fracture healing. Understanding loss of muscle mass after injury is important to design impactful rehabilitative and nutrition interventions in this complicated patient population.