

Femur Fractures Are a Risk Factor for Multiple Organ Failure in Critically Injured Trauma Patients

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Purpose: Femur fractures occur frequently after high-energy trauma and reflect significant soft-tissue disruption and inflammation. The role of femur fractures in subsequent posttraumatic multiple organ failure (MOF) is of considerable interest. The purpose of the present study is to examine femur fractures as a risk factor for MOF in critically injured trauma patients. We hypothesize that femur fractures contribute to the risk of MOF in multisystem trauma patients.

Methods: We performed a single-center, retrospective investigation at an academic, tertiary care trauma center. Inclusion criteria were adult patients (age ≥ 18 years) with an ISS >15 . Patients with a head abbreviated injury scale (AIS) score >2 were excluded. Demographics and injury characteristics were collected. All patients with a femur fracture, defined as occurring between the proximal greater trochanter and the distal metaphyseal flare, were identified. Admission vital signs and serum lactate values during the first 24 hours of hospital admission were evaluated. The primary outcome was MOF, defined by the Denver Organ Failure score. This score requires patients to have an ICU length of stay (LOS) ≥ 2 days. Therefore, patients with an ICU LOS <2 days were excluded. The impact of femur fractures on MOF was tested with a Cox proportional hazard model. Interaction terms were created between femur fracture and chest injury (femur_chest), femur fracture and abdominal injury (femur_abd), chest and abdominal injury (chest_abd), and femur fracture, chest injury, and abdominal injury (femur_chest_abd). Results are presented as hazard ratios (HRs) with 95% confidence intervals (CIs).

Results: 737 patients were available for analysis. Median ISS was 26 (IQR [interquartile range]: 21-34) and median age was 47 years (IQR: 29-58). Median admission Glasgow coma scale score was 15 (IQR: 14-15), median chest AIS score was 3 (IQR: 1-4), and median abdominal AIS score was 1 (IQR: 0-3). 104/737 patients (14.11%) sustained a femur fracture and MOF occurred in 70/737 patients (9.50%). After considering injury characteristics and interaction terms, only femur fracture (HR: 1.88, 95% CI 1.06-3.35) and chest_abd injury (HR: 1.05, 95% CI 1.01-1.09) were associated with MOF, after adjusting for age (HR: 1.03, 95% CI 1.01-1.04) and admission lactate (HR: 1.16, 95% CI 1.08-1.23).

Conclusion: Femur fractures are an independent risk factor for MOF in critically injured trauma patients. The risk of MOF increased by 88% in patients with a femur fracture compared to patients without a femur fracture. There was no interaction between a femur fracture and other organ system injuries and the risk of MOF. Future studies are necessary to further define the precise mechanism by which femur fractures impact the risk of MOF.