

Risk Factors for Amputation in Combat-Related Tibia Injuries

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Purpose: The current conflicts in Iraq and Afghanistan represent the longest sustained U.S. armed conflicts in history. As of September 1, 2014, 1573 individual service members have sustained combat-related major limb amputations. Despite the high volume of combat-related amputations, there is no current treatment algorithm to guide the orthopaedic surgeon caring for high-energy lower extremity fractures in the acute or sub-acute in the present study. The purpose of this study is to describe the risk factors for amputation in combat-related fractures of the tibia resulting from injuries sustained in OIF (Operation Iraqi Freedom)/OND (Operation New Dawn)/OEF (Operation Enduring Freedom).

Methods: A retrospective review was conducted using the surgical scheduling system to identify patients who sustained tibia injuries from OIF and OEF. 176 patients with 195 tibia injuries were included for review of 65 distinct demographic and perioperative variables. Data were compiled and analyzed using Student t test for continuous data, and both Fisher exact test and chi-square for categorical data. Significance was set at a P value of <0.05.

Results: There was an amputation rate of 19.4% in this cohort. Age, gender, military service, tobacco use, mechanism of injury, days spent in the intensive care unit, days to fasciotomy closure, total transfusions, use of negative pressure wound dressing, size of segmental tibial defect, positive admission or downrange wound culture, nerve injury, infection within 6 weeks, positive deep vein thrombosis or pulmonary embolism, and heterotopic ossification were not associated with failed limb salvage on univariate analysis. Factors associated with failed limb salvage included the type of definitive fixation utilized in the treatment of tibia fractures (P = 0.009), time to definitive fixation (P <0.0001), Gustilo-Anderson classification (P <0.0004), type of bone graft (P = 0.023), the need for fasciotomy (P = 0.011), presence of a segmental bone defect (P = 0.043), vascular injury (P <0.0001), the need for a flap (P = 0.016), and culture-confirmed soft-tissue infection or osteomyelitis 6 weeks after definitive fixation (P <0.0001). Multivariate analysis elucidated vascular injury (odds ratio [OR], 3.25; 95% confidence interval [CI], 1.11-9.49; P = 0.031) and culture-confirmed soft-tissue infection or osteomyelitis (OR, 6.56; 95% CI, 2.24-19.24; P = 0.001) as independent predictors of amputation.

Conclusion: To our knowledge, this is the largest and most comprehensive series in the war trauma literature to describe risk factors for amputation in the combat-related tibia injury. Vascular injury and soft-tissue infection or osteomyelitis 6 weeks after definitive fixation were identified as independent risk factors for amputation.