



US DEPARTMENT OF DEFENSE
BLAST INJURY RESEARCH PROGRAM
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Extremity Injury

The Association of Specific Serious Lower Extremity Injuries with Delayed Amputation

Numerous studies have reported high proportions of extremity injuries in Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF), with estimates between 41 percent and 54 percent of injuries. Despite medical interventions to preserve the viability and functionality of the injured limb(s), delayed amputations and long-term impairments may occur as a result of these injuries. The goal of this analysis, requested and funded by Extremity Trauma and Amputation Center of Excellence (EACE), was to determine whether specific acute lower extremity injuries are associated with delayed lower extremity amputations. The Naval Health Research Center's (NHRC's) Expeditionary Medical Encounter Database (EMED) was queried for battle-related lower extremity injuries between 2003 and 2014, which resulted in 9,592 injury episodes. The Abbreviated Injury Scale (AIS) was used to categorize the lower extremity injuries by severity and the maximum lower extremity AIS level for each injury episode was determined. All episodes with a maximum lower extremity AIS of 1, as well as individuals with amputations occurring on the day of injury were excluded. The final sample was 3,509 Service Members, with at least one lower extremity injury having an AIS of 2 or greater. The frequency of specific lower extremity fractures (femur, tibia, fibula, calcaneus, talus, or navicular) as well as lower extremity nerve and vessel injury was determined. The association of each injury and specific injury combinations with a delayed amputation (amputation occurring after date of injury) was calculated (Figure 1). A delayed amputation was identified in 308 (8.8 percent) injured Service Members in the sample. The delayed amputation and no amputation groups did not differ in average age at the time of injury (25.7 years versus 26.0 years) or branch of Service (Army, 67.2 percent versus 63.6 percent), and the majority of the injury episodes were blast related (84.1 percent versus 72.3 percent). There was no difference between the groups in mean or categorized Injury Severity Score (ISS; 14.9 versus 11.7) with the majority of both groups having an Injury Severity Score (ISS) greater than 9. The most frequent fractures were of the tibia (29.5 percent) and fibula (25.2 percent), yet the highest rates of delayed amputation were in Service Members with navicular (35.9 percent), talus (29.7 percent), or calcaneus (27.9 percent) fractures. Logistic regression with paired independent variables was carried out to examine the impact of multiple injuries on the odds of delayed amputation. The odds of amputation were greatest in the combination injuries of calcaneus fracture and lower extremity nerve injury, calcaneal fracture and lower extremity vessel injury, and calcaneus and tibia fractures. Although the most common fracture locations in this group of combat injuries were in the tibia and fibula; fractures of the navicular, talus, and calcaneus were more likely to result in a delayed amputation. The odds of delayed amputation increased substantially with specific injury combinations. Understanding the odds of amputation with specific acute injuries may guide clinical decision making in the acute care period.¹ Further analyses should investigate the role that other injuries and acute complications play into the risk of amputation.

¹ Eskridge, S. L., Hill, O., Clouser, M. C., Galarnau, M. R. (2016). The Association of Specific Serious Lower Extremity Injuries with Delayed Amputation. Presented at Military Health Systems Research Symposium. -Kissimmee, Kissimmee, Florida.





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FIGURE 1: Extremity Injury spectrum (not to scale) provided by Susan L. Eskridge, PT Ph.D.

