

What Is the Surgical Burden of Treatment for High-Energy Lower Extremity Trauma?

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Purpose: Treatment of limb-threatening high-energy lower extremity trauma (HELET) consists of a series of surgeries to temporize, definitively reconstruct or amputate, and manage complications. Understanding the dynamic nature of treatment and the factors that influence treatment pathways is necessary to develop shared decision-making models of therapies that optimize outcomes. An important step toward developing a decision-making model is to describe the burden of surgery. The purpose of this study was to describe the operative burden for patients who underwent reconstruction or amputation after severe distal tibia, ankle, and mid- to hindfoot injuries.

Methods: The study population included patients 18 to 60 years of age enrolled in a prospective multicenter study of extremity trauma in the United States. The primary outcome was the number of surgeries that were classified as temporizing, definitive, or complication surgery based on a standard set of criteria defining phases of treatment. Poisson regression was used to test the hypothesis that ankle / pilon injuries and failed reconstructive surgeries that resulted in amputation would undergo the greatest operative burden among type of injury and ultimate treatment disposition, respectively.

Results: 575 participants with 221 ankle and pilon injuries, 141 talus and calcaneal injuries, and 213 other foot injuries were included in this analysis. 2297 surgeries were recorded over 18 months of follow-up, giving an average of 4 surgeries (range, 1-21) per participant. Those with ankle / pilon injuries averaged 4.7 surgeries (range, 1-21) whereas hindfoot and other foot injuries averaged 3.4 (range, 1-10) and 3.7 (range, 1-14) surgeries per participant ($P < 0.01$). Participants undergoing reconstruction ($n = 454$), amputation ($n = 92$), and failed reconstruction followed by amputation ($n = 29$, 6% of all attempted salvages) had an average of 3.7 (range, 1-21), 4.6 (range, 1-14), and 6.2 (range, 3-14) surgeries, respectively ($P < 0.01$). A total of 847 temporizing, 965 definitive, and 485 complication surgeries were performed. The most common procedures during each phase of treatment were irrigation and debridement and temporary external fixation (temporizing), open reduction with plate fixation (definitive), and transtibial amputation (complication).

Conclusion: We quantified and classified the large surgical burden for patients undergoing reconstruction or amputation for HELET. Patients with ankle / pilon injuries and those who underwent unsuccessful reconstruction followed by amputation had the greatest burden of surgery. Defining and characterizing the surgical burden of different phases of treatment will allow us to identify time-dependent predictors of treatment that will be used in future dynamic decision-making models that optimize patient outcomes.