

**Combat Periarticular Tibia Injury Outcome Study (CAPTIOUS): Risk Factors for Reoperation and Amputation After Open Periarticular Tibia Fractures**

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**Purpose:** Combat-related open periarticular tibia fractures are complex injuries that are frequently coupled with concomitant injuries. The purpose of this report is to identify risk factors for reoperations and amputation in patients with combat-related periarticular tibia fractures.

**Methods:** After obtaining IRB approval, a retrospective review was conducted of all patients who sustained a combat-related periarticular tibia (plafond and plateau) fracture during Operation Enduring Freedom and Operation Iraqi Freedom between 2003 and 2011. The institution's electronic medical records system and the armed forces Joint Trauma Registry (JTR) were queried and collected data included patient characteristics, injury patterns, treatment modalities, reoperation rates, complications, and outcomes. Logistic regression analysis with reoperations and amputation as the main outcome measures against injury and treatment characteristics were performed to identify significant predictors of delayed amputation.

**Results:** 145 patients sustained 146 combat-related periarticular tibia fractures (66 pilon, 80 plateau) during the time period observed. The mean age was  $26.7 \pm 6.8$  years, with the majority (86%) of fractures the result of a blast mechanism. 64% (92/146) of the injuries were open fractures (67 IIIa, 18 IIIb, 7 IIIc). Flap coverage was performed in 18 cases (9 pedicle, 9 free). 55% percent of the extremities had ipsilateral fractures (81/146) with the calcaneus (19) and distal femur (18) being the most common location. Open reduction and internal fixation was the primary mode of fixation in 80% of the fractures with the remaining fractures definitively treated with external fixation or hybrid fixation. The overall deep infection rate was 23% (34/146) with 73% (25/34) of the deep infections occurring in the open fractures. The organisms most frequently implicated as the cause of deep infection in the open fractures were *Acinetobacter* and *E-Coli*. For the nine closed fractures complicated by infection, gram-positive organisms were primarily implicated (methicillin-resistant *Staphylococcus aureus* [MRSA], methicillin-sensitive *S. aureus* [MSSA], and group B *Streptococcus*). Radiographic evidence of posttraumatic osteoarthritis occurred in 46% (67/146) of the injuries (43 pilon, 24 plateau). Over 61% (89/146) of the fractures required reoperation for complications after definitive closure ( $P < 0.005$ ). The most common cause for early reoperation was due to the development of a deep infection ( $P < 0.01$ ). The most common cause for late operation was secondary to the development of posttraumatic osteoarthritis. The overall delayed amputation rate was 18% (26/146) and 36% (9/25) of the open fractures complicated by infection underwent delayed limb amputation. The majority (62%) of the amputated limbs sustained ipsilateral fractures (16/26). The time from injury to definitive fixation and wound closure averaged 16.25 days and was predictive of delayed amputation ( $P < 0.05$ ). Based on logistic regression analysis the development of a deep infection, time to fixation, and need for reoperation after definitive fixation were found to be independent predictors of late amputation.

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device he or she wishes to use in clinical practice.

Fixation method, ISS, and need for flap had no correlation with reoperation or amputation rate. The overall fracture union rate was 93%.

**Conclusion:** Open periarticular tibia fractures as a result of combat-related trauma are associated with high complication rates, reoperation rates, and higher than expected delayed amputation rates. These findings are substantially higher than that observed within the reported civilian literature. Based on our study, careful counseling and expectation management must be provided in those war-injured trauma patients with open periarticular fractures undergoing attempts at limb salvage.