Open Tibia and Femur Fractures: Early Antibiotics Minimize Infection with Primary Wound Closure

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Purpose: Early antibiotics and wound coverage have been shown to decrease infection rate in all type 3 open tibia fractures. It is unknown if this is similar in type 1, 2, and 3A open tibia and femur fractures that are primarily closed. The goal of this study is to examine factors decreasing deep infection risk in type 1, 2, and 3A open tibia and femur fractures with primary wound closure.

Methods: We retrospectively reviewed 234 type 1, 2, and 3A open tibia (143) and femur (91) fractures. Exclusion criteria were: (1) <18 years old, (2) delayed >24 hours to operating room, (3) requiring repeat debridement, (4) incomplete data, and (5) negative pressure dressings or other adjunct wound management. Demographics, American Society of Anesthesiologists (ASA) class, mechanism, smoking status, diabetes status, and ISS were included for analysis. Time to first dose antibiotics and time to surgical debridement after injury were taken from the medical record. These were compared using one-way analysis of variance, chi-square, or Fisher exact tests, as appropriate. Binary regression was used to determine if a model could be created that would be predictive of postoperative deep infection as defined by Centers for Disease Control and Prevention (CDC) criteria. Receiver operating characteristic (ROC) curves were then used to identify threshold values.

Results: Age, ASA class, mechanism, smoking, diabetes, and ISS did not predict deep infection rate. Deep infection occurred in 2 of 91 (2.2%) of femur fractures, including 0 of 27 (0%) type 1, 0 of 13 (0%) type 2, and 2 of 51 (3.9%) type 3A. Femur infection rate did not differ by type (P = 0.66). Deep infection occurred in 11 of 143 (7.7%) of tibia fractures, including 0 of 50 type 1 (0%), 6 of 67 type 2 (10.4%), and 5 of 26 type 3A (19.2%). In tibia fractures the infection rate increased with fracture type (P = 0.005). Femur fracture infection rates were significantly lower, regardless of type, compared with type 2 (P = 0.04) and type 3A tibia fractures (P = 0.006). No individual variable besides time to antibiotics predicted infection. Using the threshold value from the ROC curve, infection was 5.9 times more common (odds ratio = 5.9 (95% confidence interval [CI]: 1.7 to 19.8; P = 0.004) in patients with time to antibiotics >154 min (9 of 102, 8.9% vs 4 of 132, 3.0%; P = 0.004).

Conclusion: Time from injury to antibiotics predicts infection in type 1, 2, and 3A open tibia and femur fractures that are primarily closed. This reinforces prior research in type 3 open tibia fractures and suggests a similar effect in open femurs and type 1 and 2 open tibia fractures. Our study suggests that prehospital antibiotics can improve outcomes in all open fractures, regardless of severity.