

Fracture Union Following Infected Hardware Fixation: A Prospective Population-Based Cohort Study

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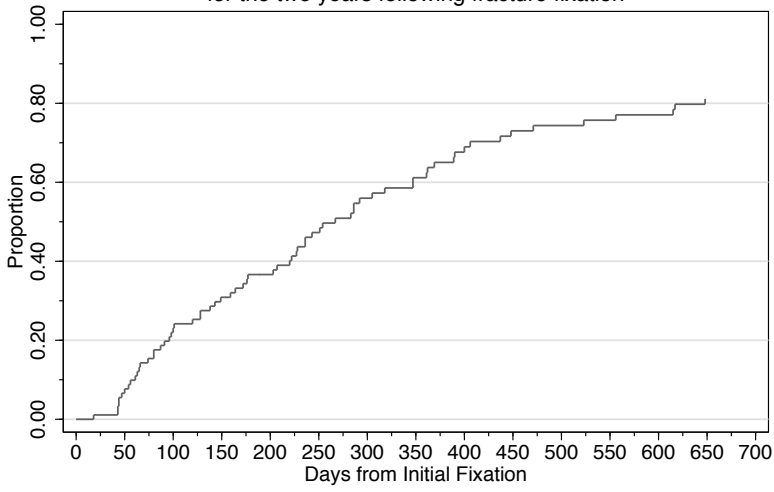
Purpose: Orthopaedic devices are increasingly used for internal fixation of fractures. Approximately 5% of initially inserted internal fixation devices become infected, frequently leading to delayed fracture union, high morbidity, and significant mortality. Standard orthopaedic treatment involves antimicrobial therapy combined with surgical debridement and/or primary removal of infected hardware. Management remains a clinical dilemma, particularly regarding the need for primary device removal, as scant literature is available to aid decision making. The primary aim of this study was to determine the overall rate of fracture union following infected fracture fixation with combined orthopaedic and infectious diseases (ID) management.

Methods: 93 consecutive patients with infected hardware following fracture fixation referred by the orthopaedic service to the ID service for combined management were enrolled. Demographic information, fracture characteristics and fixation dates, time to fracture union, and details regarding infecting organism and antimicrobial therapy for every patient enrolled were entered into a computerized database in real time. Clinical assessment, medical records, and radiographs were reviewed to determine time to radiographic and clinical union. Non-normal numerical data was summarized by median and semi-interquartile range (SIQR). Survival analysis techniques were used to describe the time to union and assess its relationship to the initial surgical management and other factors. P values were calculated using Peto-Peto-Prentice test.

Results: 70 males and 23 females with a median age of 44 years (SIQR 13.5) met the inclusion criteria. Of these, 65 lower limb and 26 upper limb fractures were identified. 26 (28%) were open fractures. Methicillin-sensitive *Staphylococcus aureus* (MSSA) (58%) was the most frequent infecting organism, followed by methicillin-resistant *S. aureus* (MRSA) (12%), gram negative (9%), and other gram positive (4%) bacteria. A mixed growth of organisms not including MRSA or MSSA represented 2%, while no organism was identified in 15% cases. The median duration of IV antibiotics was 42 days (SIQR 5.5 days). Overall 82% of patients achieved union at 2 years following initial fracture fixation (Figure). Fracture union was achieved in 68 of 82 (83%) patients treated with initial hardware retention and 9 of 11 (82%) who underwent immediate removal of hardware at time of infection. The difference was not significant ($P = 0.91$). Median time from first fracture fixation to union was 267 days (SIQR 202). Fracture union did not vary between upper (median 227 days; SIQR 154) and lower (median 286; SIQR 369) limb fractures ($P = 0.19$).

Conclusion: Fractures with infected hardware requiring long-term antibiotic therapy, combined with management from a dedicated ID service, can expect a union rate of 82% at 2 years following initial fracture fixation. Differences in union rate were not observed between immediate hardware retention/removal or upper/lower limb fractures.

Proportion of Infected Fractures United for the two years following fracture fixation



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.