How Do Treatment Methods Affect Outcome of Surgery for Fracture-Related Infection?

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Purpose: Treatment strategies for the management of fracture-related infection (FRI) have not been standardized. Many components of care may contribute to a successful outcome or failure. We investigated the clinical outcomes of patients treated for FRI at 3 centers, in the UK and the Netherlands.

Methods: All patients with FRI, confirmed by the FRI Consensus Definition and treated surgically, were included. Data were collected on demographics and specifics of surgery, including time from injury, soft-tissue reconstruction, type of stabilization, and use of systemic and local antibiotics. The rates of eradication of infection and union were assessed. Treatment method and outcome associations were determined using unadjusted and adjusted Cox Proportional Hazards modeling, inverse probability of treatment weighting (IPTW), and logistic regression at 12 and 24 months.

Results: 433 FRIs were treated in 429 patients with mean age 49.7 years (range, 14-84). FRI affected the tibia in 226 (52.2%), femur in 94 (21.7%), pelvis in 26 (6%), humerus in 20 (4.6%), and foot bones in 19(4.4%). Mean follow-up was 26 months (range, 12-72). At presentation, 243 fractures were not healed (56.1%). Eradication of infection was successful in 86.4% of cases and 86% of unhealed infected fractures were healed at final review. 3.3% required amputation. Outcome was not dependent on age, or time from injury (recurrence rate 16.5% in FRIs treated at 1-10 weeks; 13.1% at 11-52 weeks; 12.1% at >52 weeks: $P = 0.52$). Tobacco smoking adversely affected outcome (25% failure vs 9.6%: $P<0.0001$). Debridement and retention of a stable infected implant (DAIR) had a failure rate of 22.3%; implant exchange (to new internal fixation), 16.7%; and conversion to external fixation, 7.4%. DAIR was significantly worse than conversion to external fixation ($P = 0.01$). Time from injury did not affect the outcome of DAIR or any other fixation method. The use of a free flap in the tibia improved the success rate from 80.4% to 92.1%($P = 0.044$). The use of local antibiotics reduced the recurrence rate from 18.8% to 9.9%($P = 0.022$).

Conclusion: This study is the first to consider outcome for all FRIs, at all time points, with all treatment modalities. With modern treatment methods, time from injury was not an independent determinant of outcome. It should not be used alone in decision-making. Soft-tissue reconstruction with FRI of the tibia, smoking cessation, and wider use of local antibiotics have the potential to improve outcomes.