Does Local Antimicrobial Therapy Reduce Infection Recurrence in the Treatment of Fracture-Related Infection?

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INTRODUCTION:
Antibiotics may be implanted directly into bone at the time of debridement surgery for orthopaedic infections. This study investigated the management and clinical outcomes of patients treated surgically for fracture-related infection (FRI) between 2015 and 2019. We aimed to ascertain the possible benefit of this aspect of surgical therapy for fracture-related infections.

METHODS:
All patients with FRI, confirmed by the FRI Consensus Definition¹ and treated surgically at three specialist orthopaedic centers, were included. Data were collected on patient characteristics, time from injury to FRI surgery, soft tissue reconstruction, type of stabilization, systemic antimicrobial therapy, and use of local antibiotics. All patients were followed up for a minimum of one year.

Infection-free survival, ascertained blinded to treatment, was compared using adjusted and unadjusted Cox proportional hazards modeling and logistic regression for infection recurrence at 12 and 24 months. Inverse Probability of treatment weighting (IPTW) was used to account for confounding factors in the causal pathway between surgical treatment and infection recurrence.

RESULTS:
In total, 433 FRIs were treated in patients with a mean age of 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%). Patients were followed up for a mean of 26 months (range 12-72). Overall, 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.

Successful outcome was not dependent on age, or time from injury (recurrence rate 16.5% in FRI treated at 1-10 weeks after injury; 13.1% at 11-52 weeks; 12.1% at >52 weeks: p=0.52). The use of a free flap in the tibia improved the success rate from 80.4% to 92.1% (p=0.044).

In total, 216 people received bioabsorbable local antibiotic therapy and 36 people received non-bioabsorbable local antibiotic therapy as part of surgical treatment for FRI. FRI recurrence was identified for 25/252 (10%) of those who received local antibiotic therapy and 34/181 (19%) of those who did not (p=0.022). Cohort participants who received local antibiotic therapy had, on average, longer preoperative symptom duration than those who did not. The IPTW adjusted hazard ratio for FRI recurrence was 0.56 (95% confidence interval 0.26 to 1.17), with consistent treatment effects at 12 and 24 months.

DISCUSSION AND CONCLUSION:
Effective management of FRI involves several elements of medical and surgical care. Each one may influence the outcome. In this study, we analyzed all FRIs, occurring at all timepoints and assessed the effect of surgical and medical parameters on outcome. Logistic regression and IPTW allowed an evaluation of each element of care individually and in relation to each other element.

Local antibiotic therapy was associated with reduced FRI recurrence at one and two years after treatment. It may be considered as part of a comprehensive treatment strategy for fracture-related infection. Interestingly, outcome was not dependent on time from injury suggesting that division of FRIs into categories based on time from injury may not be helpful with modern treatment algorithms.
