A single dose of ceftriaxone reduced the incidence of wound and nosocomial infections after surgery for closed fractures


Objective
To evaluate the effectiveness of prophylactic antibiotics in the surgical treatment of closed limb fractures.

Design
Randomised, double-blind, placebo-controlled trial with 120-day follow-up.

Setting
14 trauma units in the Netherlands.

Patients
2195 patients aged ≥ 18 years (mean age 55 y, 52% women) who were scheduled for primary osteosynthesis or placement of a prosthetic device in the treatment of closed limb fractures were included. Exclusion criteria were hypersensitivity to cephalosporins, use of antimicrobial agents, symptoms of infection in the week before surgery, pregnancy, immunosuppressive treatment, simple percutaneous Kirschner wire fixation, or external fixation as a single percutaneous procedure.

Intervention
1105 patients were allocated to a single, 2-g dose of ceftriaxone at anaesthesia induction, and 1090 patients were allocated to placebo. All patients were treated by the operation techniques normally used by the surgeons at the participating centers, and no additional antibiotics were used to irrigate the wounds.

Main outcome measures
Wound infection and nosocomial infection at 10, 30, and 120 days.

Main results
10 days after surgery, 5 patients (0.5%) in the ceftriaxone group developed wound infection compared with 41 patients (4.0%) in the placebo group (P < 0.001). This absolute risk reduction (ARR) of 3.5% means that 29 patients would need to be treated (NNT) with a single 2-g dose of ceftriaxone before surgery (compared with placebo) to prevent 1 additional wound infection, 95% CI 20 to 43; the relative risk reduction (ARR) was 88%, CI 71% to 95%.

After day 10, the rates of infection were similar in the 2 treatment groups (31 new infections in the ceftriaxone group vs 38 in the placebo group). Overall, after 120 days, 36 patients (4%) in the ceftriaxone groups developed superficial or deep-wound infection compared with 79 patients (8%) in the placebo group (P < 0.001) [ARR 4%; NNT 22, CI 15 to 39; RRR 56%, CI 36% to 70%]. The incidence of nosocomial infection (urinary tract and respiratory infections) in the first month was 2% in the ceftriaxone group and 10% in the placebo group (P < 0.001).

Conclusion
A single dose of ceftriaxone given before surgery reduced the incidence of wound infection and early nosocomial infection after surgery for closed fractures.

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*Numbers calculated from data in article.

Commentary
A deep-wound infection after surgery for a fracture results in prolonged hospitalisation and antibiotic treatment, increased risk for delayed union or nonunion of the fracture, and frequently the need for multiple subsequent operative procedures. The Dutch Trauma Trial showed a statistically and clinically significant reduction in both wound and nosocomial infections, and confirmed the effectiveness of single-dose antibiotic prophylaxis in preventing wound infection in the surgical treatment of closed fractures.

This study differs from some previous studies that failed to show a benefit because of its size (2195 patients), a larger-than-usual antibiotic dose (2 g), and the use of a third-generation cephalosporin (ceftriaxone). Ceftriaxone has a long half-life and broad antibacterial coverage that includes gram-negative and gram-positive aerobes and some anaerobes. The authors of the Dutch Trauma Trial did not provide complete details on observed complications of routine ceftriaxone prophylaxis, such as gastrointestinal or cutaneous reactions, increased hepatic enzymes, or haematologic abnormalities, but apparently their incidence was low. In this study, wound infections increased hospital stay by 36 days, but the authors’ estimated saving of U.S. $486 per patient needs to be validated by a more complete cost analysis that includes the costs of subsequent treatments. The authors also identified, using stepwise logistic regression, that age > 65 years, prosthetic hip surgery, and procedures > 2 hours’ duration increased the risk for wound infection. Although the hospitals and trauma units that formed the setting for this study were not described, the results probably are applicable to all hospitals where surgery is used to treat fractures. Thus, based on this trial, antibiotic prophylaxis with this regimen or other proven regimens (1, 2) should be routine clinical practice for adults with closed fractures.

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References