Acta Orthop. Scand. 58, 361–364, 1987

Cefuroxime prophylaxis in trochanteric hip fracture operations

Sven Åke Hedström, Lars Lidgren[1], Ingemar Sernbo[2], Carsten Törholm[1] and Rolf Önnerfält[1]

In a double-blind randomized study of antibiotic prophylaxis in trochanteric fractures operated on with a nail and plate, a 24-hour intravenous administration of cefuroxime 0.75 grams thrice daily (Group B) was compared with the previous regimen of cefuroxime for 24 hours plus 6 days of oral cephalexin (Group A). In each group, 56 (Group A) and 65 (Group B) patients could be evaluated. One deep infection occurred in Group B with growth of *Staphylococcus aureus*, and another 4 patients had discharge and cultures of which 2 showed *S. aureus*. In Group A, 6 patients had signs of an infection, and in 3 patients cultures were taken but were negative. There were no differences between the groups. We concluded that the prophylaxis time need not be longer than 3 days.

In clean orthopedic surgery, antibiotic prophylaxis has proven efficient for arthroplasties (Eriksson et al. 1973, Williams & Gustilo 1984) and trochanteric hip fractures (Boyd et al. 1973).

In the early 1970s, a 14-day prophylaxis was commonly used, but 1 day only seems to be just as effective in arthroplasties (Pollard et al. 1979, Nelson et al. 1983).

However, in arthroplasties the most common causative bacteria are Gram-positive, usually *Staphylococcus aureus*, whereas patients with trochanteric hip fractures often have urinary tract infections and pressure sores where a Gram-negative infection is a common problem (Tengve & Kjellander 1978).

We have compared 24 hours of parenteral cefuroxime prophylaxis with the same regimen followed by 6 days of peroral cephalexin in patients operated on for trochanteric hip fractures.

Lund University Departments of Infectious Diseases and of [1]Orthopedics, Lund, and of [2]Orthopedics at Malmö General Hospital, Malmö, Sweden

Correspondence: Dr. Sven Åke Hedström, Department of Infectious Diseases, University Hospital, S-222 85 Lund, Sweden

Patients and methods

Totally, 251 patients with trochanteric fractures were admitted to the Departments of Orthopedics in Lund and Malmö from September 15, 1982 to May 31, 1984. Most of them were operated on on the following day with fixation of the fracture with a plate and sliding nail. Only half the number of patients with trochanteric fractures in Malmö entered in the study because at that time Ender nailing was still used for the other half.

The inclusion criteria for enrollment of the patients in the study were, in addition to the surgical method mentioned above, operation within 2 days and the judgement that the patient was able to take oral medication. Patients with severe senility, advanced decreased renal function, and with known or suspected cephalosporin or penicillin allergy were excluded. The study was approved by the Ethics Committee of the medical faculty at Lund University.

Prophylactic methods. The patients were allocated blindly and at random in blocks of 20 according to a computerized list to either of the two groups, Group A or B. Patients in Group A received cefuroxime 0.75 grams thrice daily intravenously, the aim being to start 1–2 hours prior to surgery followed by cephalexin 0.5 grams, two

tablets thrice daily orally for 6 days. The patients belonging to Group B were given only cefuroxime followed by placebo tablets the following 6 days. The bottles were labelled with a code number by Glaxo Ltd, Great Britain and delivered by the hospital pharmacy. The placebo tablets appeared identical to those of cephalexin.

Observations and follow-up. The routine for following up the operated on trochanteric fractures in uncomplicated cases was inspection of the wounds on Day 4, on Day 7, prior to discharge from the hospital, and after 4 months or 6 weeks as outpatients in Lund and Malmö, respectively. When complications were suspected, the wound was inspected immediately and the patients continued their stay in the hospital. The clinical criteria for infection were the classical inflammatory signs: purulent or serous discharge. In cases of signs of infection in or around the wounds, swabs should be taken for aerobic an anaerobic cultures.

Criteria for infection. Deep infection: Septic fever concomitant to purulent infection affecting the osteosynthesis area eventually necessitating a removal of the foreign material. Superficial infection: Purulent discharge with or without a positive culture. Serous discharge with a concomitant positive culture.

Table 1. Description of 121 evaluable patients

Group	A	B
Number of patients	56	65
women	39	48
men	17	17
Mean age (range)	78 (51–97)	74 (34–96)
women	78 (59–97)	78 (44–96)
men	76 (51–89)	63 (34–92)
Mean operation time in min (range)	62 (27–155)	66 (25–168)
women	60 (27–155)	63 (20–120)
men	69 (40–115)	75 (25–168)
Number of hematomas	4	6
Number of compromised hosts	6	4

Adverse drug experiences. Allergic symptoms, gastrointestinal disturbances, and other suspected drug-related events were recorded, as well as the reason for discontinuing the trial drugs.

Evaluation of the results and statistical methods. The results were evaluated blindly. Fisher's exact 2-tail test was used at the 5 per cent significance level.

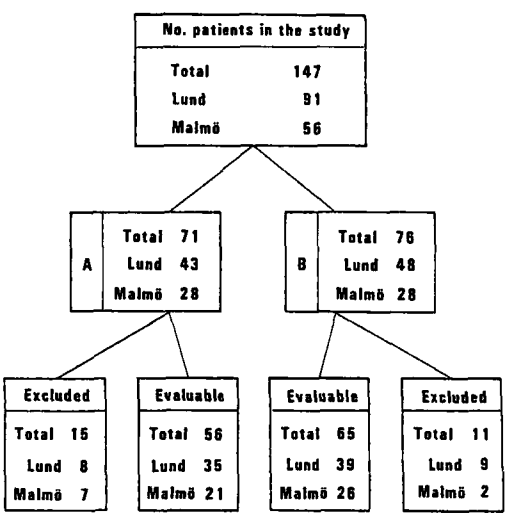

Figure 1. Survey of the trochanteric fractures entering the study. A. Patients randomized to cefuroxime for 24 hours and cephalexin for 6 days. B. Patients randomized to cefuroxime for 24 hours followed by placebo.

Results

Of the 251 patients with trochanteric hip fractures, 147 were enrolled in the study: 91 in Lund and 56 in Malmö. The relatively low number of enrolled patients was mostly due to the rigid criteria for inclusion or exclusion. After randomization, some patients were excluded from the final evaluation because of violation of the protocol: drop-outs or early withdrawals (Figure 1). Thus, 56 patients completed the (Group A) regimen of cefuroxime 1 day + 6 days of cephalexin, and 65 patients (Group B) completed the regimen of cefuroxime 1 day and placebo (Table 1).

Mortality. Six patients, 3 in each group, died of causes not related to the drugs; 1 had pneumonia and died later from a pulmonary embolism.

Infections. In Group A, 6 patients had clinical signs of infection; cultures taken from three wounds with inflammation or purulent discharge were negative and were not done in 3 patients with only serous secretions (Table 2).

In Group B, one deep infection caused by *Staphylococcus aureus* started on Day 9 and the nail plate had to be extracted after fracture healing because of the infection. Two additional patients had positive cultures, but these infections were superficial. Two more patients had serous discharges, but cultures were not taken.

Adverse experiences. Only 3 patients showed side effects of the drugs; two in Group A had exanthema and itching, respectively, and 1 in Group B had gastric complaints.

Noninfectious complications. Ten patients had early hematomas at the operation site, but in no instance was infection noted (Table 1).

Table 2. Wound infections and bacteriological results in 121 evaluable patients

	A. prophylaxis 1 + 6 days (n 56)	B. prophylaxis 1 day (n 65)
Wound appearance		
Serous discharge	3	4
Purulent discharge	2	1[a]
Inflammation	1	
Culture		
Staph. aureus		2[a]
Staph. aureus + Strept. faecalis		1
Negative	3	
Not performed	3	2

[a] One patient with deep infection.

Discussion

Antibiotic prophylaxis in surgery should be restricted to situations where the risk of bacterial contamination of the wound is high in the perioperative period. When a large amount of foreign material is inserted, the risk for wound sepsis is increased (Mader & Cierny 1984). The chosen prophylactic drugs must have a spectrum against those microorganisms that are known from experience as being common etiologic agents. Patients with trochanteric hip fractures are different from prosthetic cases regarding age, associated diseases, bacteriologic spectrum, systemic infections, urinary tract infection, etc. Besides staphylococci, Gram-negative enteric bacteria are common in wound infections in hip fractures (Neu 1984). Thus, cephalosporins with a spectrum against the actual bacterial species are suitable. The efficacy of cephalotin, cephalexin, and cephradine as prophylactic agents in a nail and plate insertion in trochanteric femoral fractures has been shown earlier (Lindberg & Tjörnstrand 1978, Tengve & Kjellander 1978).

For ecologic reasons and in order to reduce adverse reactions and costs, the prophylactic drugs should not be given longer than necessary. Ideally, the prophylaxis should be used only perioperatively.

The most important goal with antibiotic prophylaxis in hip surgery is to prevent deep infections. We had one deep infection after 24 hours of prophylaxis, i.e., a rate of 1.5 per cent, which was not statistically different from the control group.

Our low rate of deep infection agreed with earlier studies (Lindberg & Tjörnstrand 1978, Tengve & Kjellander 1978). Wound appearance was about the same in the two study groups (Table 2); only in Group B could Gram-positive bacteria be isolated from wound discharges; the negative results in group A may be explained by the ongoing antibiotic prophylaxis.

Our results confirm that the period of antibiotic prophylaxis in patients operated on for hip fracture should be substantially shorter than 1 week.

The question still remains whether it is possible to reduce the prophylaxis time to 24 hours. Tengve & Kjellander (1978) have shown that 3 days of cephalosporin prophylaxis was effective. Surin et al. (1983) have stated that initial discharge from the wound in joint prosthetic surgery gave more late deep infections. We have chosen 3 days of prophylaxis until further studies support the efficacy of a shorter regimen.

References

Boyd R J, Burke J F, Colton T. A double blind clinical trial of prophylactic antibiotics in hip fractures. J Bone Joint Surg (Am) 1973 Sep;55(6):1251–8.

Ericson C, Lidgren L, Lindberg L. Cloxacillin in the prophylaxis of postoperative infections of the hip. J Bone Joint Surg (Am) 1973;55:808–13, 843.

Lindberg L, Tjörnstrand B. Prophylactic use of cephradine against postoperative infections of pertrochanteric fractures. Arch Orthop Trauma Surg 1978 Aug 30;92(2–3):189–90.

Mader J T, Cierny G. The principles of the use of preventive antibiotics. Clin Orthop 1984 Nov;(190):75–82.

Nelson C L, Green T G, Porter R A, Warren R D. One day versus seven days of preventive antibiotic therapy in orthopedic surgery. Clin Orthop 1983 Jun;(176):258–63.

Neu H C. Cephalosporin antibiotics as applied in surgery of bones and joints. Clin Orthop 1984 Nov;(190):50–64.

Pollard J P, Hughes S P, Scott J E, Evans M J, Benson M K. Antibiotic prophylaxis in total hip replacement. Br Med J 1979 Mar 17;1(6165):707–9.

Surin V V, Sundholm K, Bäckman L. Infection after total hip replacement. With special reference to a discharge from the wound. J Bone Joint Surg (Br) 1983;65:412–418.

Tengve B, Kjellander J. Antibiotic prophylaxis in operations on trochanteric femoral fractures. J Bone Joint Surg (Am) 1978 Jan;60(1):97–9.

Williams D N, Gustilo R B. The use of preventive antibiotics in orthopaedic surgery. Clin Orthop 1984 Nov;(190):83–8.

Acknowledgements

Konsul Thure Carlsson's Memorial Foundation, Greta and Johan Kock's Foundation, Norrbacka-Eugenia Foundation and Alfred Österlund's Foundation.